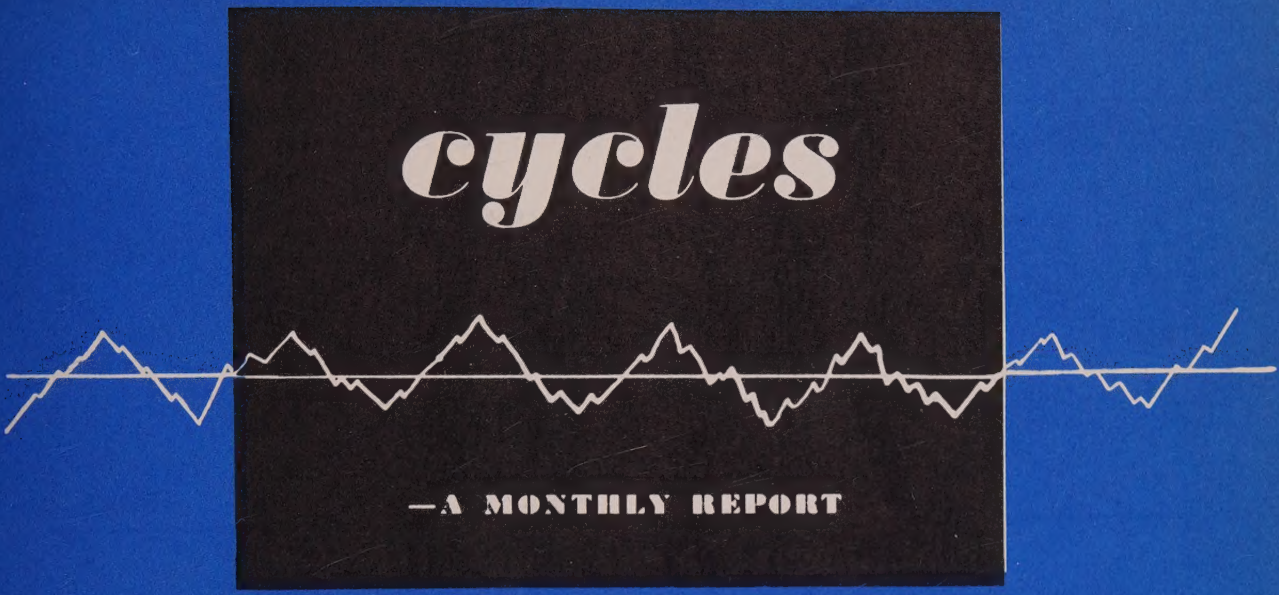


cycles

—A MONTHLY REPORT

March 1954

FOUNDATION FOR THE STUDY OF CYCLES
New York, New York

CONTENTS

Page

THE DIRECTOR'S LETTER 83

RESEARCH
THE 9.2- AND THE 8.5-YEAR CYCLES IN PIG IRON PRICES 86

FOUNDATION AFFAIRS 96

SUPPLEMENT
Chapter VIII and Appendices II and III, from *Cycles, The Science of Prediction,* a book by Edward R. Dewey and E. F. Dakin, and the 1954 Postscript 97

THE FOUNDATION FOR THE STUDY OF CYCLES

The Committee of the Foundation consists of the following scientists and administrators:

UNITED STATES OF AMERICA

Copley Amory, Chairman Emeritus

Charles Greeley Abbot
Research Associate
Smithsonian Institution

Harold Elmer Anthony
Chairman and Curator
Department of Mammals
American Museum of Natural History

George Baekeland, Chairman of the
Committee of the Foundation
The Bakelite Corporation

Harold Gardiner Bowen
Vice Admiral, U.S. Navy, Retired
Executive Director, Thomas Alva
Edison Foundation

Verne Burnett
Partner
Verne Burnett Associates

Hon. W. Cameron Forbes
Member, Board of Trustees
Carnegie Institution of Washington
Life Member of the Corporation
Massachusetts Institute of Technology

Webster N. Jones
Vice Presedent
Carnegie Institute of Technology

Daniel Trembly MacDougal
Former Director
Department of Botanical Research and
Laboratory of Plant Physiology
Carnegie Institution of Washington

John Quincy Stewart
Professor of Astronomical Physics
Princeton University

CANADA

Hon. Charles Camsell
Former Commissioner
Northwest Territories

Frank Cyril James
Principal and Vice-Chancellor
McGill University

GREAT BRITAIN

Sir Patrick Ashley Cooper
Governor
Hudson's Bay Company

Julian Sorell Huxley
Former Director General
United Nations Educational, Scientific and Cultural Organizations

Edward R. Dewey, Director

CYCLES—A MONTHLY REPORT IS PUBLISHED BY THE FOUNDATION FOR THE STUDY OF CYCLES EVERY MONTH EXCEPT DURING JULY AND AUGUST AT THE FOUNDATION'S OFFICE AT EAST BRADY, PENNSYLVANIA. SUBSCRIPTION RATES $10.00 A YEAR. ENTERED AS SECOND CLASS MATTER AT THE POST OFFICE AT EAST BRADY, PENNSYLVANIA. MEMBERSHIP OFFICE, 9 EAST 77TH STREET, NEW YORK 21, NEW YORK.

COPYRIGHT 1954

cycles
-a monthly report

VOLUME V NUMBER 3 MARCH 1954

The official Bulletin of the Foundation for the Study of Cycles

The Director's Letter

Dear Member:

The mail bag is always interesting. For instance here is a letter from a man well known to you. I wish I could give you his name, but in this instance it would not be appropriate to ask for permission. However, as you can see from internal evidence, he is a person of importance. The letter follows:

Believes in Cycles

" Dear Mr. Dewey:

"I believe in cycles; in fact your Monthly Report...is one of the few MUST publications which I always personally read. Incidentally, you may be interested to know there are over 125 daily, weekly, and monthly publications carefully screened by my experts..."

Testimonials Needed

In connection with getting new members (see Foundation Affairs, page 96) it would help if you, too, would write me a testimonial letter regarding *Cycles—A Monthly Report*. Say whatever you like, as long as it is true. Indicate whether or not I may use your name and that of your firm, (a) directly, or (b) on request, or (c) not at all.

The more members we can get, the better job I can do for *you*.

THE 9-YEAR CYCLE IN PRICES

As I promised you, this month I am reporting to you upon the 9-year cycle in pig iron prices.

The fact that this cycle has kept on coming true for more than 75 years since discovery, *and that it also continues backward in time for as far as figures are available,* should (but of course it won't!) have a profound effect upon the skepticism with which cycles are regarded by the uninformed.

CYCLES IN MANUFACTURING PRODUCTION

During the month we have made progress in determining cycles in manufacturing production, but this additional work is not yet far enough along to enable me to report upon it. I hope, however, to be able to make another progress report in our issue for April.

I can hear you say, "Cycles in manufacturing production or in the stock market are much more important—to me anyway— than cycles in pig iron prices and copper prices. Why don't you put first things first?"

The answer is that the work on cycles in pig iron prices and copper prices was done several months ago for a man who has graciously permitted us to publish the findings for your benefit. It isn't a case of cycles in pig iron prices *or* manufacturing production *or* stock prices. It is a case of pig iron price cycles or nothing! There are just so many hours in the day and so many dollars in the till. We do the best we can with what we have to work with.

A LETTER FROM ROGER BABSON

I recently received the following letter from Mr. Roger Babson. I think Mr. Babson's letter and my reply may be of interest to you.

"Dear Mr. Dewey:

"Perhaps some month you would write an article on the *causes* of the Cycles,— taking the Business Cycle as an illustration. The Babson Organization is coming to believe that the IMPATIENCE of people to buy or to sell is surely the cause of the Stock Market Cycle.

Feelings Are Important

"Would you say it is also an important cause of the General Business Cycle? We are now getting data on the "feelings" of over 400 different communities, but we have not yet determined how to weight these.

"How do you feel about new inventions, products, and methods which are now on drawing boards and in test tubes affecting the duration of a Business Cycle? Surely the automobile industry has been a factor almost equal to a world war. If atomic energy is used for peaceable purposes could this be a factor in lengthening the normal Business Cycle? You will be interested to know that we have on our payroll three persons who spend their entire days at the Patent Office carefully scrutinizing all the patent assignments."

My Reply

In reply I said:

"Dear Mr. Babson:

"Answering your last question first, I believe that inventions are important elements in the *growth trend* of individual companies, of individual industries, and doubtless of manufacturing as a whole, but I do not believe they have *any effect whatsoever* upon the duration of a business *cycle*.

"As I see it, business *cycles* are generated by consumers.

"I am not sure whether it is the *feelings* of people as consumers or the *energy* of people as consumers which cause business cycles. Perhaps it is both, but my guess is that people's feelings are probably the more important factor.

"I think you are on the right track in attempting to measure *feelings* of various communities.

Keep Away From Bankers

"If I were given the job of measuring the feelings of a community, I would keep as far away as possible from bankers, executives, and intellectuals. Such people are not as close to their feelings as bartenders, barbers, taxicab drivers, laborers, garage mechanics, waiters, and other simple folk. Bankers and executives will tell you what they *think*, but this isn't what you want to know. You want to know what the great body of people *feel*.

"I dare say that in attempting to determine the feelings of communities you have proceeded just as I would have done.

"It seems to me—as it doubtless does to you—that impatience is one aspect of *feeling*. I can imagine that it could easily be of great importance.

Why Stock Prices Go Up and Down

"I used to think that stock prices were determined by the mass emotions of the buyers and sellers of stock. I felt that when stock buyers felt optimistic they bought, when they felt pessimistic they sold. This may indeed be a factor in market prices, but I no longer believe that it is the controlling factor. My present conjectures are something like this:

"Consumers of shirts, let us say, suddenly feel pessimistic and fearful. They refrain from buying shirts. Presently, shirt retailers note large inventories and refrain from buying. Then shirt wholesalers. Eventually manufacturers of shirts are forced to curtail production. Very smart stock market operators, learning of the actual or proposed curtailment of production, sell the stock of the shirt manufacturer.

"Of course the man in the street, not being so well informed, may and probably does buy and sell more on emotions than upon knowledge. But I suspect that, basically, the emotions of the buyers of shirts are a more important factor in stock prices, than the emotions of the buyer of the stock involved.

How Cycles Come Into the Picture

"As shirt manufacturing acts as if it were influenced by rhythmic forces of precise mathematical length, we must conclude —if the above conjectures are correct— that something stimulates the buyers of shirts at precise mathematical intervals. As they act together more than not we can conclude that this *something* is environmental—that is, that it is outside the individual shirt consumer. What this environmental factor is, is not yet known.

"The production of shirts does not fluctuate in any simple way. It acts as if it were subjected simultaneously to random factors and to a great variety of rhythmic forces which sometimes pull together and strengthen each other; sometimes oppose and weaken each other. If shirt manufacturing is the result of shirt consumption, it follows that the consumers of shirts are, on their part, influenced by a variety of cyclic forces, and, because consumers act the same way more often than not, we may conclude further that all these cyclic forces are environmental.

"So far it is clear sailing. Just as we are bathed by light of various wave lengths to which our eyes respond, I think it perfectly reasonable to assume that we may be bathed continuously by energy waves of much greater wave length which we perceive dimly through our emotions—waves which alternately elate and depress us and/or energize and relax us.

"But here is where the theory breaks down—or perhaps we should say where it has not yet been built up. Why is it, if all this is the case, that buyers of cigarettes, for example, respond predominantly to 8-year environmental cycles, whereas buyers of shirts respond more actively to 2-year cycles? What differentiates the buyer of cigarettes from the buyer of shirts, especially when he is likely to be the same person? This seems utterly fantastic and unreasonable to me, but it seems equally unreasonable to assume that the manufacturers of shirts, for example, have very much to do with the demand for shirts. The cycles *must,* pretty largely, originate in the consumer.

"Perhaps someday we will understand all these things better, but, in the meantime, if we want to forecast the behavior of any figures which act as if they were influenced by these cyclic forces, we can be assisted if we learn the wave lengths and the strengths of the forces involved as reflected in the figures themselves. This is true even if we do not yet know the mechanisms whereby the cyclic forces operate.

"Does my letter answer your letter adequately? If not please let me hear from you further."

Cordially yours,

Edward R. Dewey

Director

THE 9.2– AND 8.5–YEAR CYCLES IN PIG IRON PRICES

Summary

Cycles of 9.2 and 8.5 years in length have characterized pig iron prices from 1784 to date. The interplay of these two cycles contributes an element of strength to the present pig iron price situation. This element of strength is due to reach its peak (ideally) in the fourth quarter of 1955 (but you must take other cycles and random factors into account to know when actual prices are due to reach their peak).

During the span of available figures, the 8.5- and 9.2-year cycles in combination have prevailed over all other factors, including war and inflation, a total of 13 times; they have failed to prevail 5 times. The gains, when made, have averaged 47.2%. The losses, when suffered, have averaged 15.4%. The gain-loss ratio has been 8 to 1.

A knowledge of these two cycles in pig iron prices is not offered as a forecast or as a basis of trading. It is offered (1) to give convincing evidence of the reality of cycles of this length in this series of figures, (2) to provide a partial explanation of the variations of timing and amplitude of the so-called 9-year cycle, (3) to point up and refine the work of earlier investigators, and (4) to provide a base for future work which when completed will, it is hoped, exceed in merit the forecast made in 1875 by Samuel Benner which came true for more than 60 years with a gain-loss ratio of 45 to 1.

PIG iron prices, like all price series, are subject to a variety of forces. These forces include (a) long term growth trend, (b) inflation, (c) random events such as war, tariff changes, price control, etc., and (d) cyclic forces.

Growth Trend. For all practical purposes there is no long term trend in pig iron prices. Prices (in terms of gold) at the present time are just about the same as they were in the 1780's.

Long term growth trend is the tendency of a series of numbers to increase (or decrease) gradually over a long span of time. In the case of pig iron, the span of time under consideration is 170 years.

The word *trend* can also be used to denote a general upward or downward *tendency* over a short period of time.

Inflation. There have been two important periods of inflation—during and after the Civil War and since 1933. The course of inflation is not cyclic. The future course of inflation has to be estimated by the use of brains.

Random Fluctuations. Random events have been numerous in the history of pig iron prices. However many of the fluctuations which are commonly thought to be random fit into the cyclic patterns in such a way as to suggest that they are at least partially the result of cyclic forces.

Cycles. In addition to trend, inflation, and random forces, pig iron prices act as if they had been subject to a number of cyclic forces—some long term, some short term.

We are privileged to postulate cyclic forces when we have cyclic behavior, such as the 18 repetitions of the 9.2- and 8.5-year cycles, about to be discussed. As many repetitions as this, of the regularity evidenced, cannot reasonably be the result of chance.

The periodogram of pig iron prices which I published for you in our report for June 1952 suggested the possibility of at least 36 important cycles over 4 years in length in this series of figures.

You have to isolate, evaluate, project, and combine all these cycles, and the shorter cycles as well, before you are in a position to make the best possible cycle forecast of these figures.

The Data

Pig iron prices are shown by quarters, in currency and in gold, in Fig. 1 on the four pages next following. In Fig. 1 there is also shown the short term trend of these prices.

The 9.2-Year Cycle

If we now smooth the prices shown in Fig. 1 and express these smoothed values as percentages above or below the short term trend just referred to, we get the values shown in Fig. 2 on the same pages.

(The technician may wish to know that the trend used is a 41-quarter (10 1/4-year) geometric moving average; the smoothing was effected by means of a 17-quarter (4 1/4-year) geometric moving average.)

Such a manipulation minimizes the longer and shorter cycles more than it does cycles of medium length, such as those in the general neighborhood of 8, 9, or 10 years long.

Even casual inspection shows a cycle, slightly over 9 years in length, present throughout the entire history of 170 years. Study of the figures indicates that this cycle has the following characteristics:

The length, as nearly as we have been able to measure it, is 9.20 years from crest to crest or trough to trough. Crests fall at the first quarter of 1790 and every 9.20 years thereafter. Troughs fall 4.60 years after crests. The ideal time for the latest trough was March 1951, for the next crest, October 1955.

Typical amplitude of the ideal 9.20-year cycle in the actual prices is 112.2% at time of crest, 89.1% at time of trough. The shape, as nearly as we have been able to determine it, is zig-zag when the original data are plotted on ratio scale, but of course in the smoothed figures the tops and bottoms are rounded over. The 9.2-year cycle is diagrammed in Fig. 2 by means of a broken line.

The 8.5-Year Cycle

If we now adjust the figures in Fig. 2 for the effect of a perfectly regular 9.2-year periodicity of the characteristics indicated we get the curve shown in Fig. 3. An 8½-year cycle is clearly evident by simple inspection. It proves to have the following characteristics:

Length, 8.53 years from crest to crest (or trough to trough). Crests fall at the first quarter of 1788 and every 8.53 years thereafter. Troughs fall 4.26 years after crests. The ideal time for the latest crest was therefore February—March 1950, for the latest trough May—June 1954.

Typical amplitude of the 8.53-year cycle in actual prices was 106.4% of trend at time of crest, 94.0% of trend at time of trough. The shape, like that of the 9.20-year cycle, seems to be zig-zag (on ratio scale) in the original figures.

Fig. 4 shows the values of Fig. 2 in comparison with a synthesis of the 8.53- and 9.20-year cycles.

How would you have fared if you had had a knowledge of these two cycles back in 1784 and had bought and sold on the actual market at average prices for the quarter indicated?

There would have been 18 transactions (long side only). Of these, 13 would have been gains, 5 losses. The average gain would have been 47.2%, the average loss 15.4%. The total gains would have amounted to 613%, total losses 77%. This makes the gain-loss ratio 8 to 1.

Now, in conclusion, the purpose of this demonstration is neither to forecast pig iron prices nor to set up a profitable trading program, but rather—at this juncture—to point up the work of Juglar and Benner, to show that the cycle presists as we go backward in time, to explain some of the anomalies of timing, to establish a schedule for the future behavior of the so-called 9-year cycle, to determine its characteristics as closely as possible, and to provide the *first step* toward revising and, hopefully, improving the remarkable forecast of pig iron prices made by Samuel Benner in 1875—a forecast which came true for over 60 years with a gain-loss ratio of 45 to 1.

E.R.D.

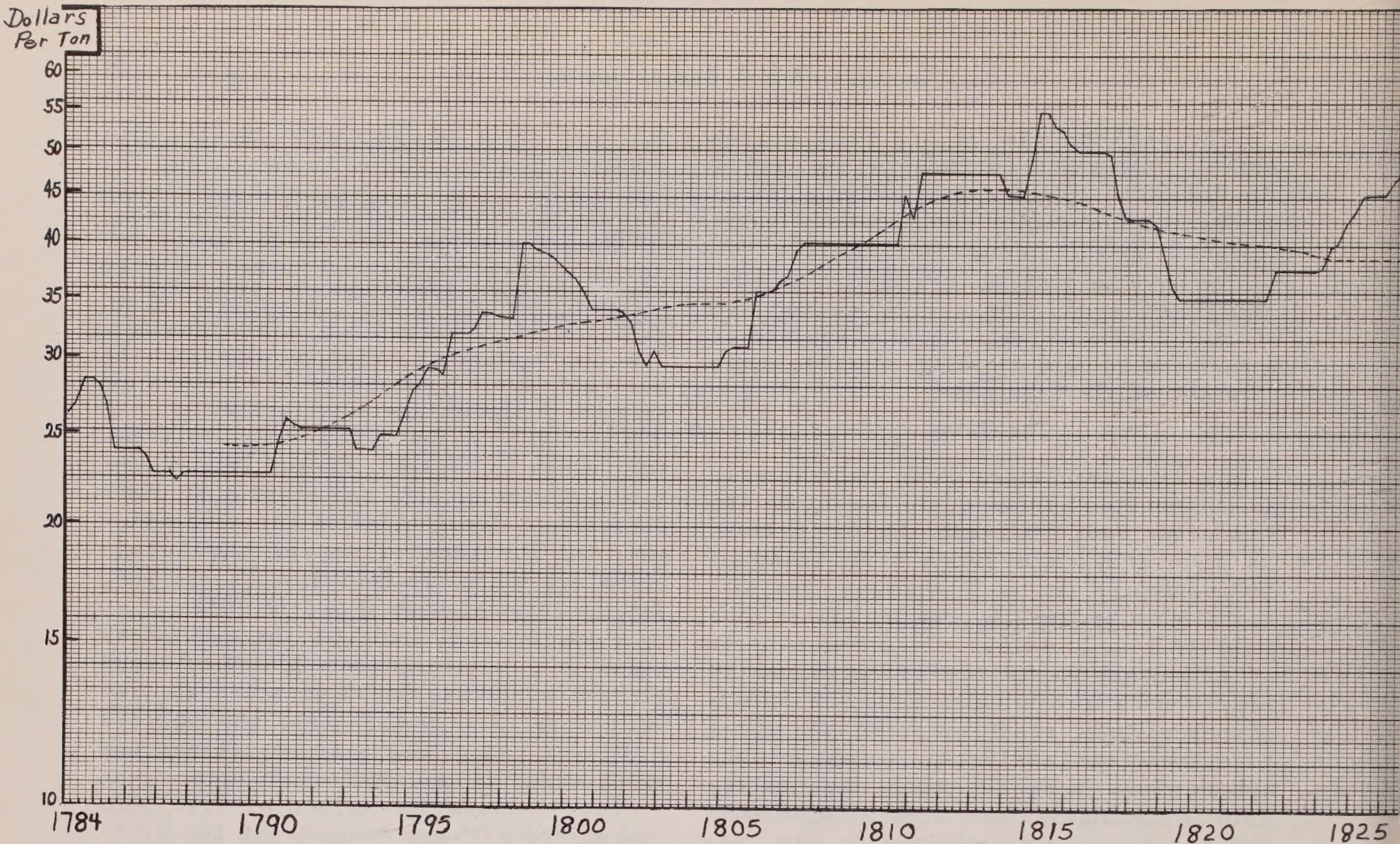


FIG. 1. PIG IRON PRICES, FIRST QUARTER 1784—FOURTH QUARTER 1953.
Solid line—actual prices. Ratio scale.
Dashed line—first quarter 1862 to fourth quarter 1878, and third quarter 1933 to date--show prices adjusted to a gold basis.
Smooth broken line—represents short term trend (41-quarter (10 1/4-year) centered moving average).

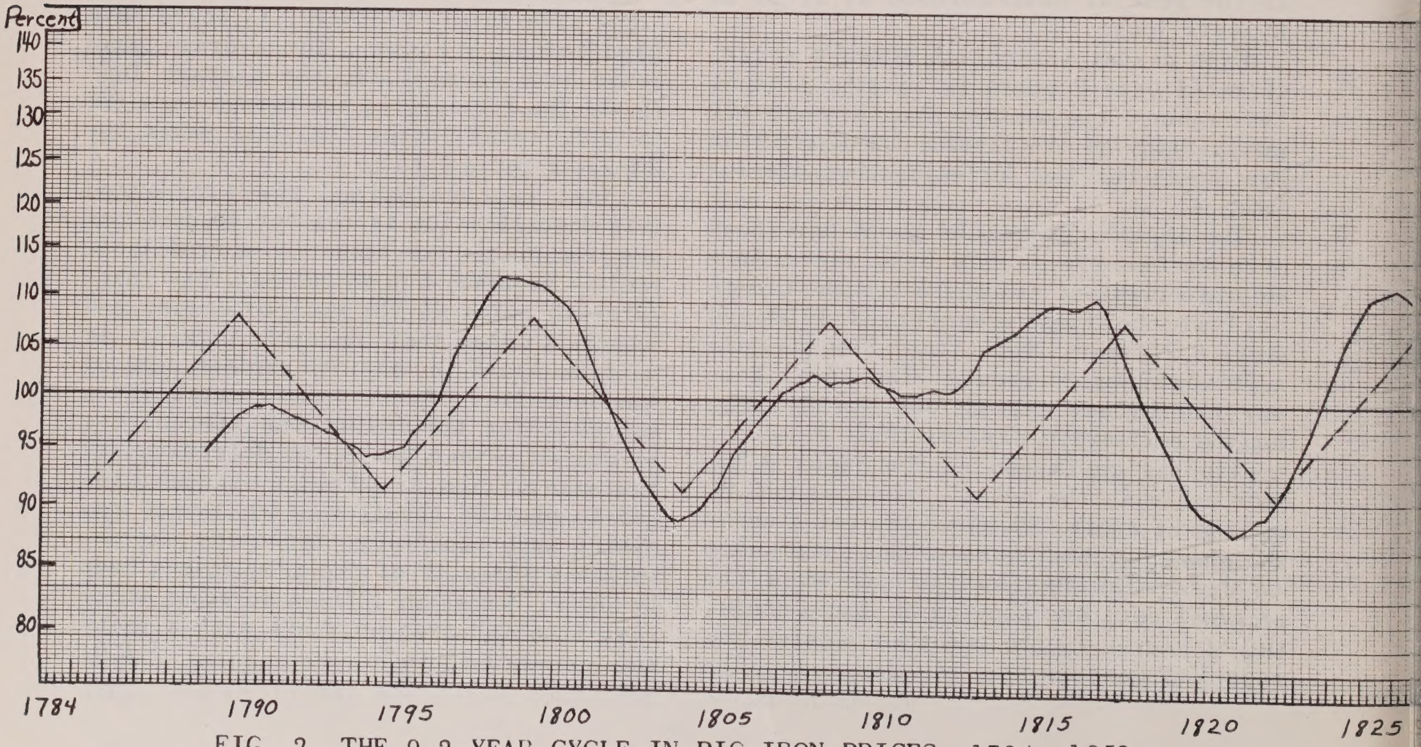


FIG. 2. THE 9.2-YEAR CYCLE IN PIG IRON PRICES, 1784—1953.
Actual prices smoothed by a 17-quarter moving average, expressed as percentages of their own 41-quarter (10 1/4-year) moving average.
The broken line diagrams the 9.2-year cycle. Ratio scale.

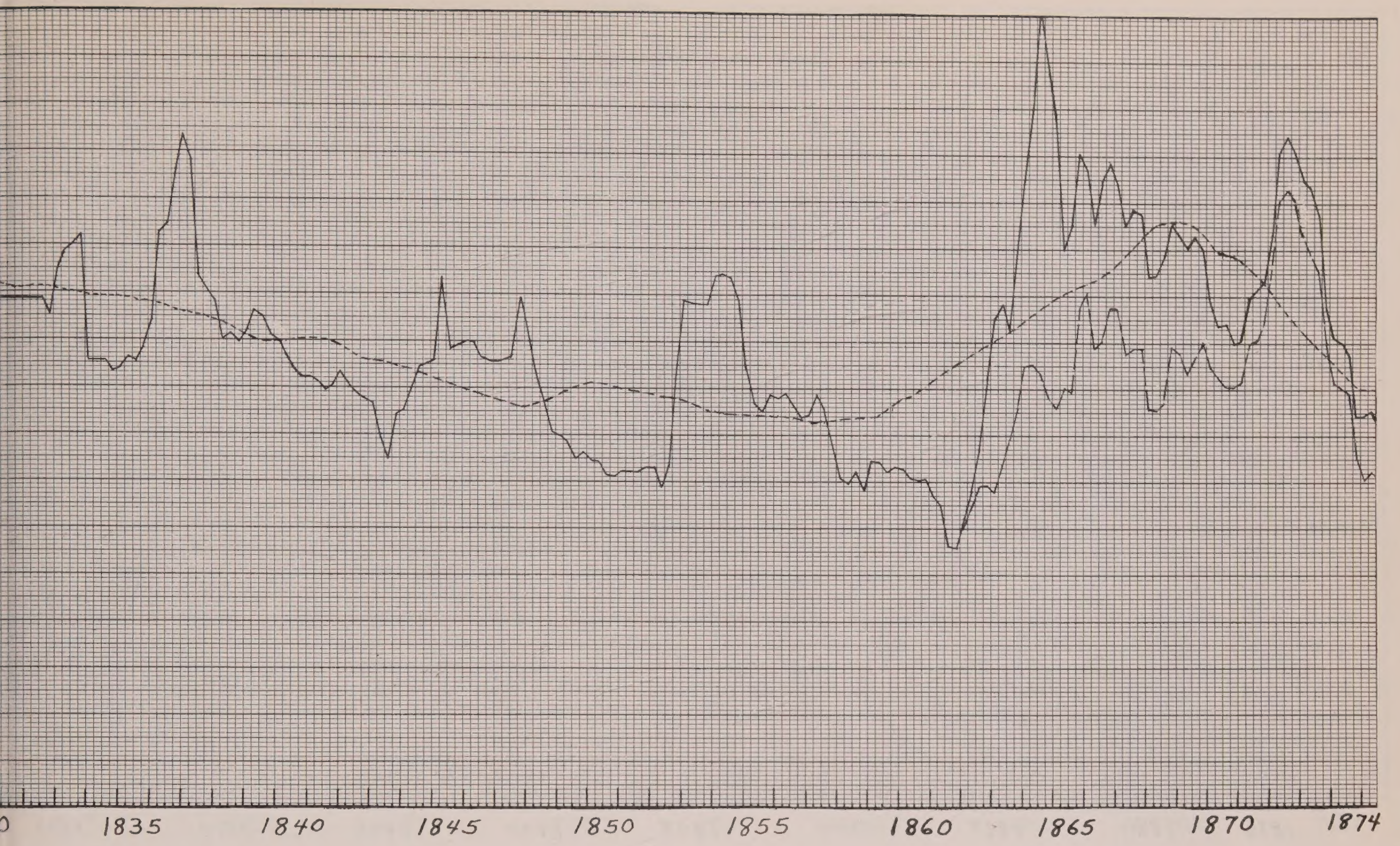


FIG. 1. (CONTINUED)

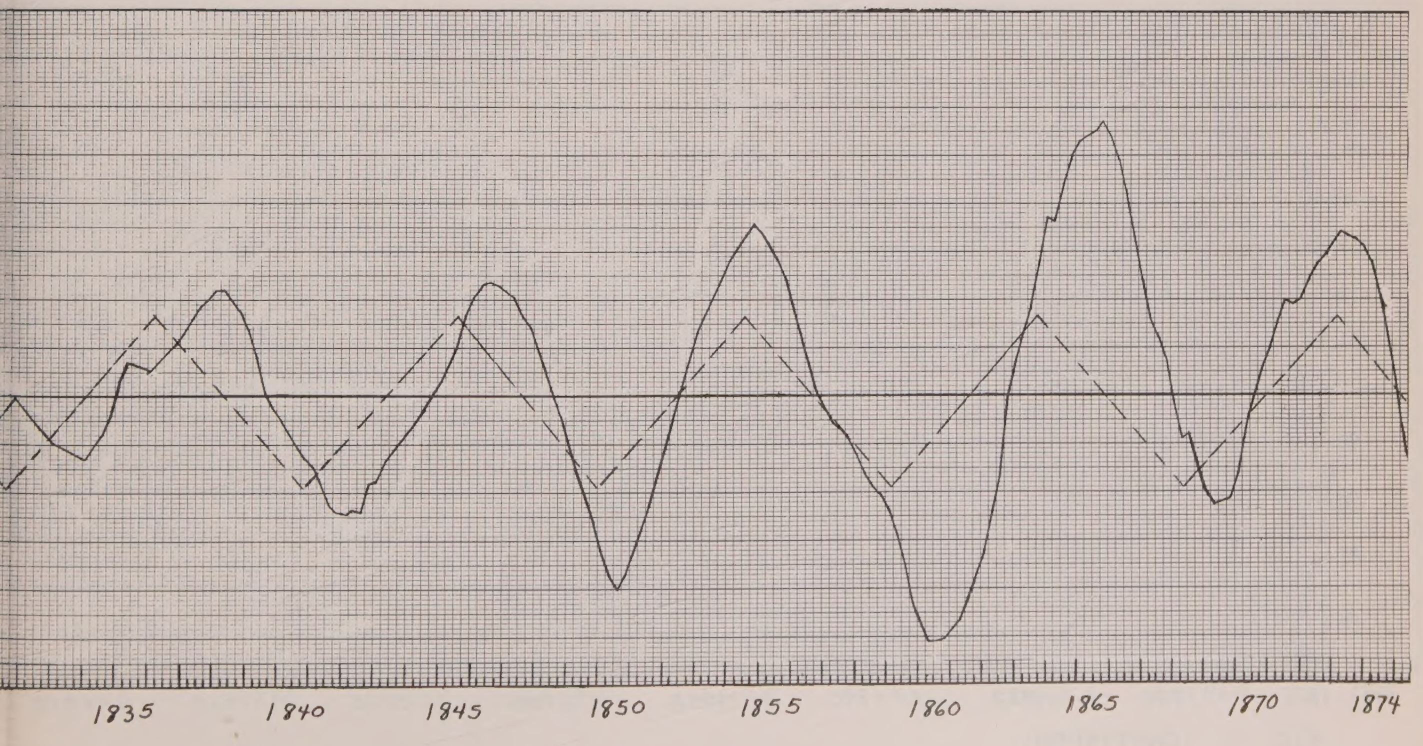


FIG. 2. (CONTINUED)

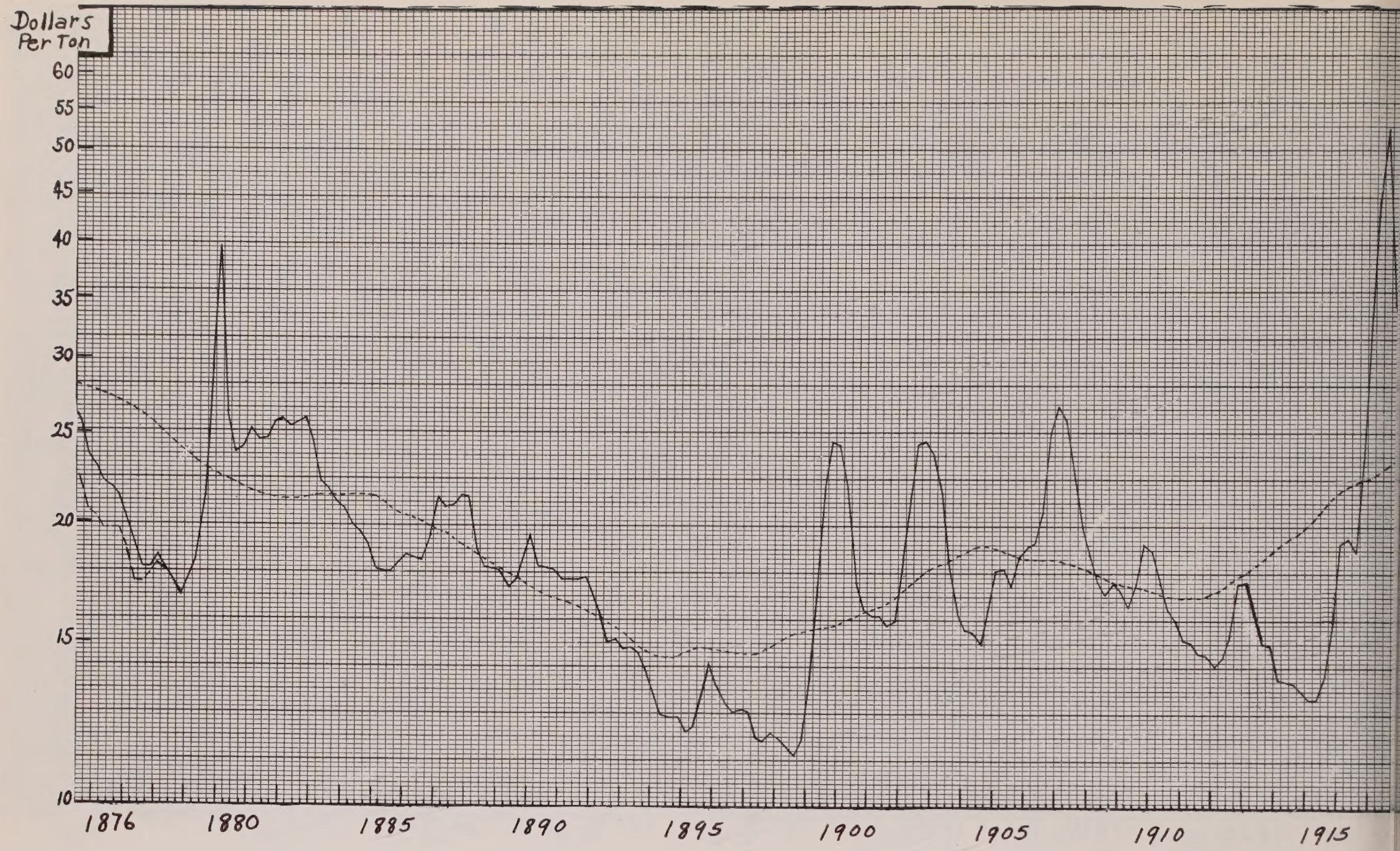


FIG. 1. (CONTINUED)

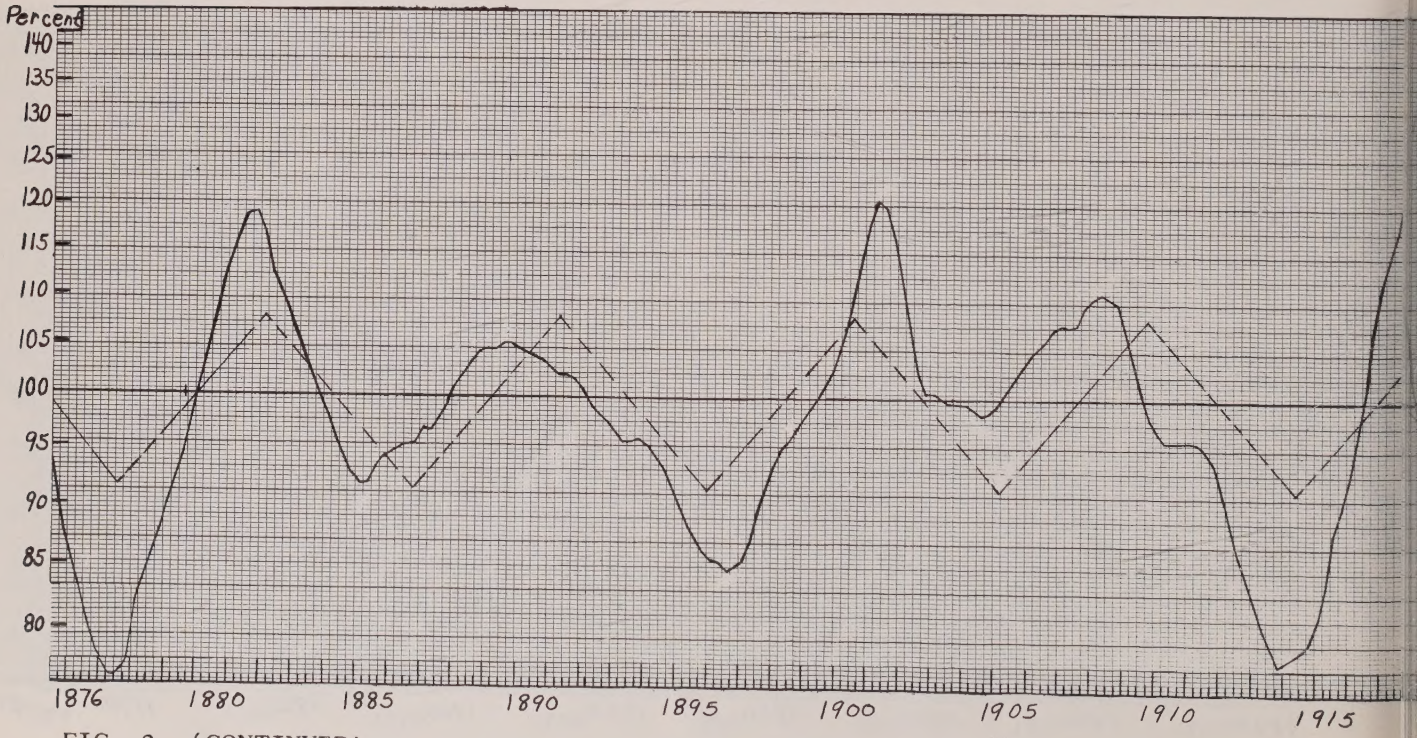


FIG. 2. (CONTINUED)

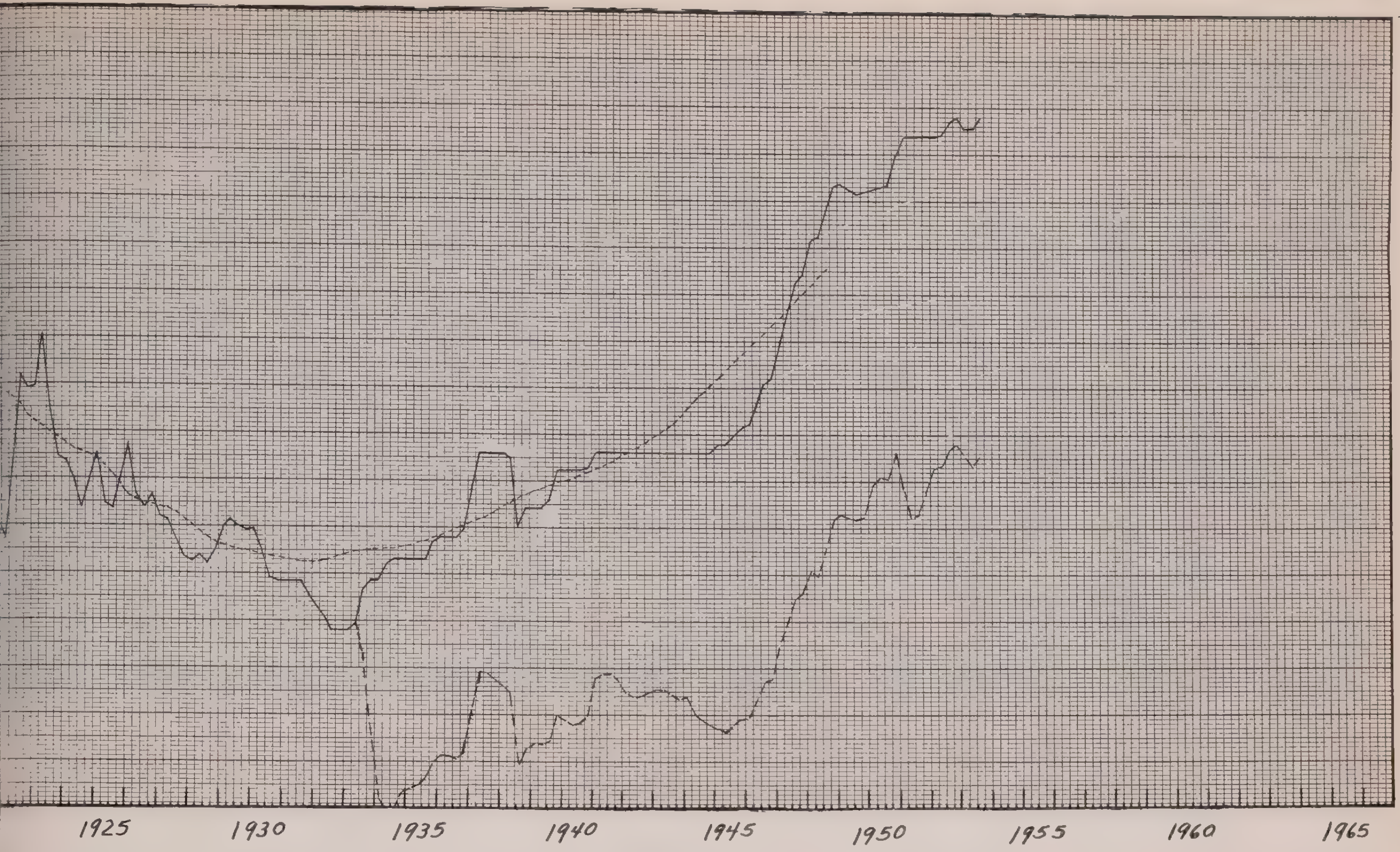


FIG. 1. (CONTINUED)

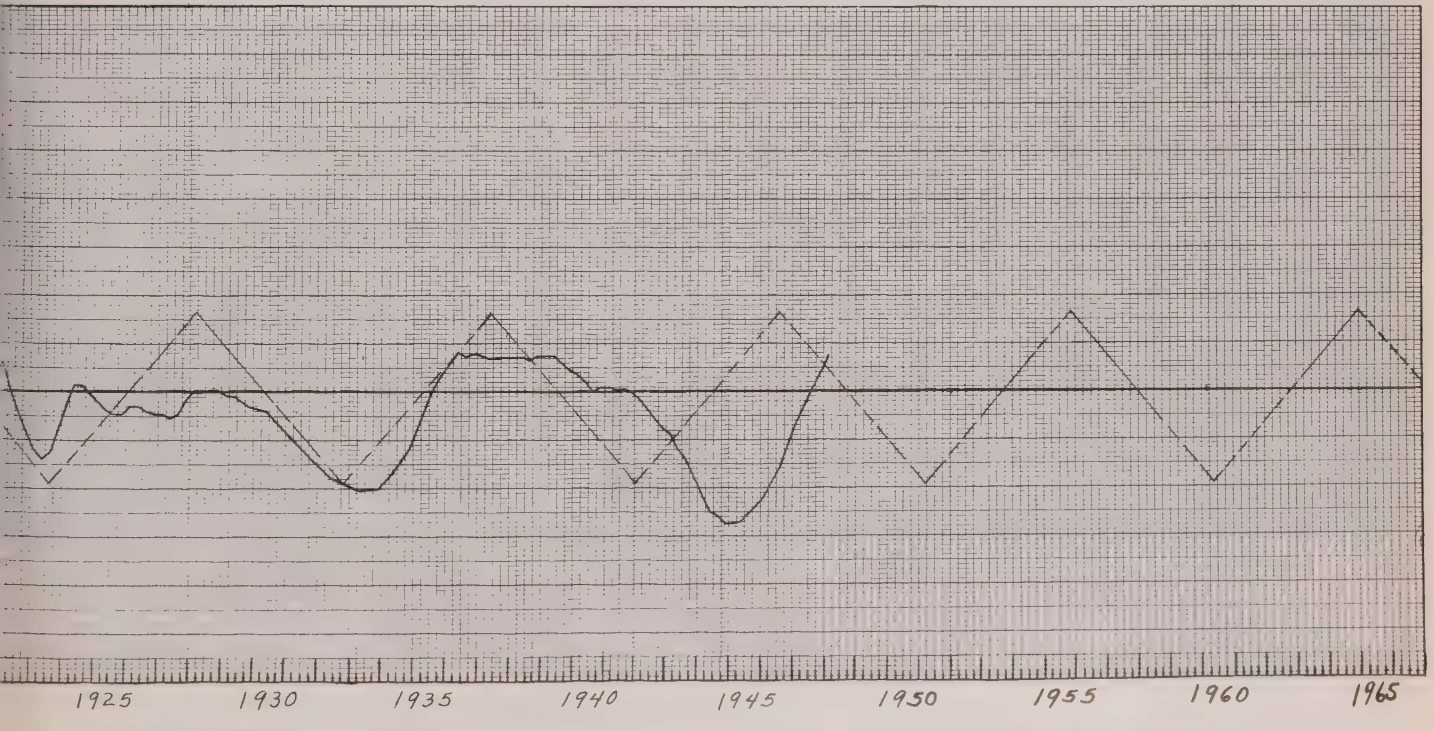


FIG. 2. (CONTINUED)

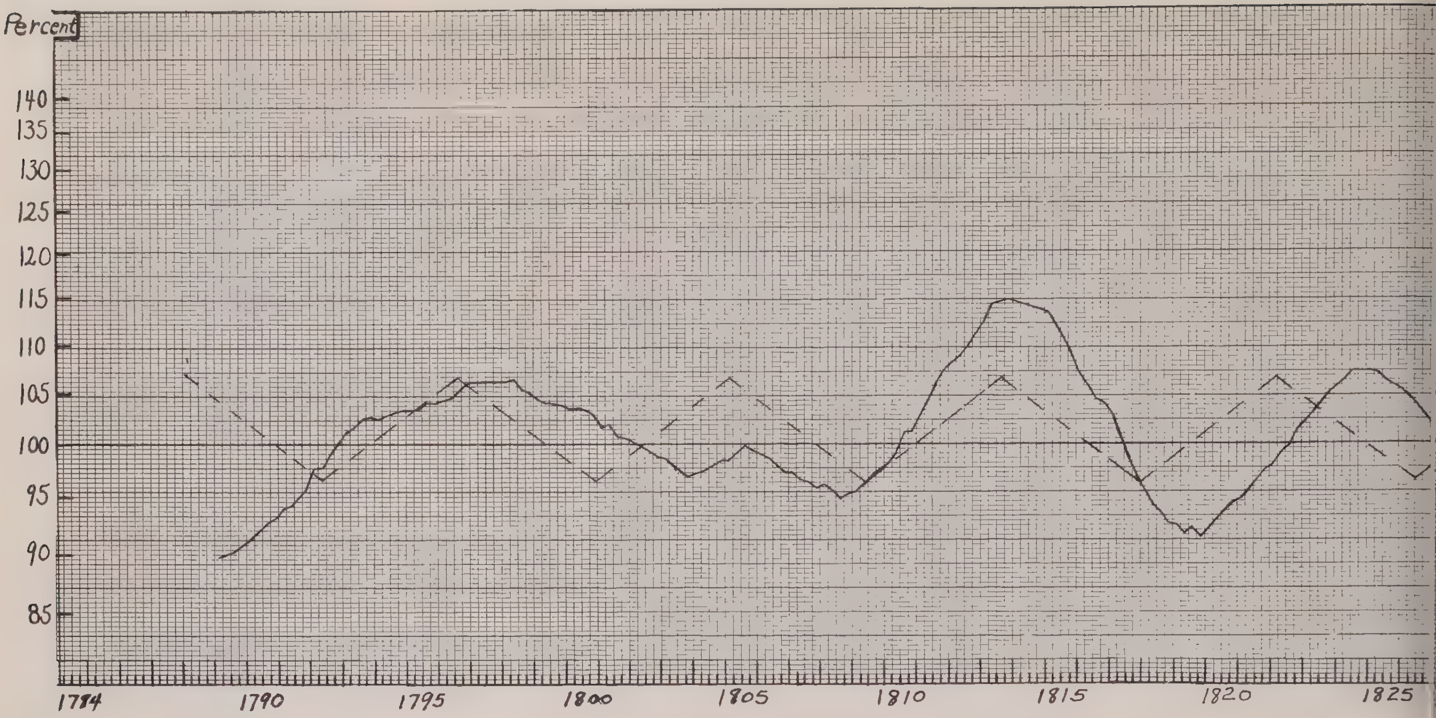


FIG. 3. THE 8.5-YEAR CYCLE IN PIG IRON PRICES, 1784—1953.
The percentages shown in Fig. 2 adjusted for a perfectly regular 9.2year cycle.
Broken line shows a diagram of a perfectly regular 8.53-year cycle. Ratio scale.

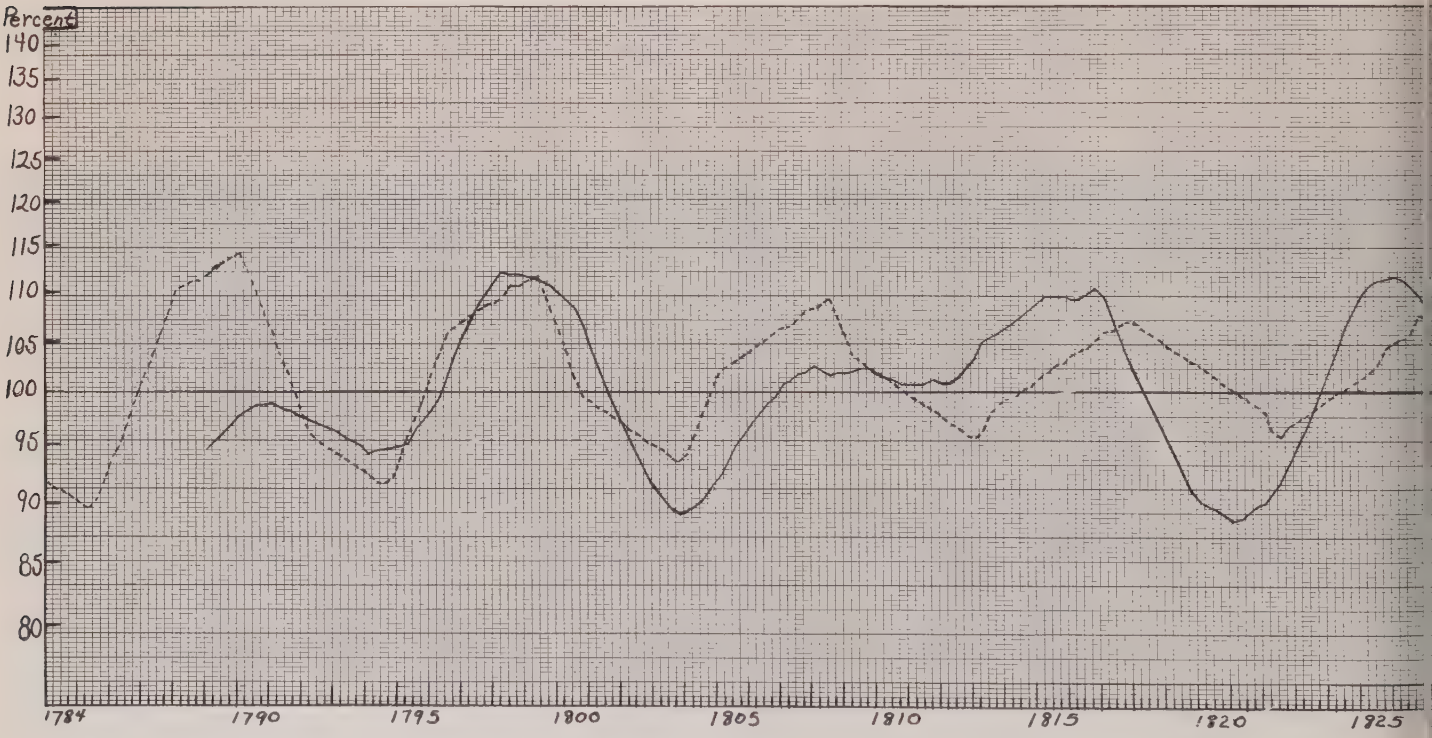


FIG. 4. A COMPOSITE OF THE 9.2- AND THE 8.5-YEAR CYCLES IN PIG IRON PRICES, 1784—1953.
The solid line on this chart is the same as the solid line in Fig. 2 namely, actual prices smoothed by a 17-quarter moving average expressed as percentages of their 41-quarter (10 1/4-year) moving average.
The broken line diagrams the composite of the 9.2- and 8.5-year cycles. Ratio scale.

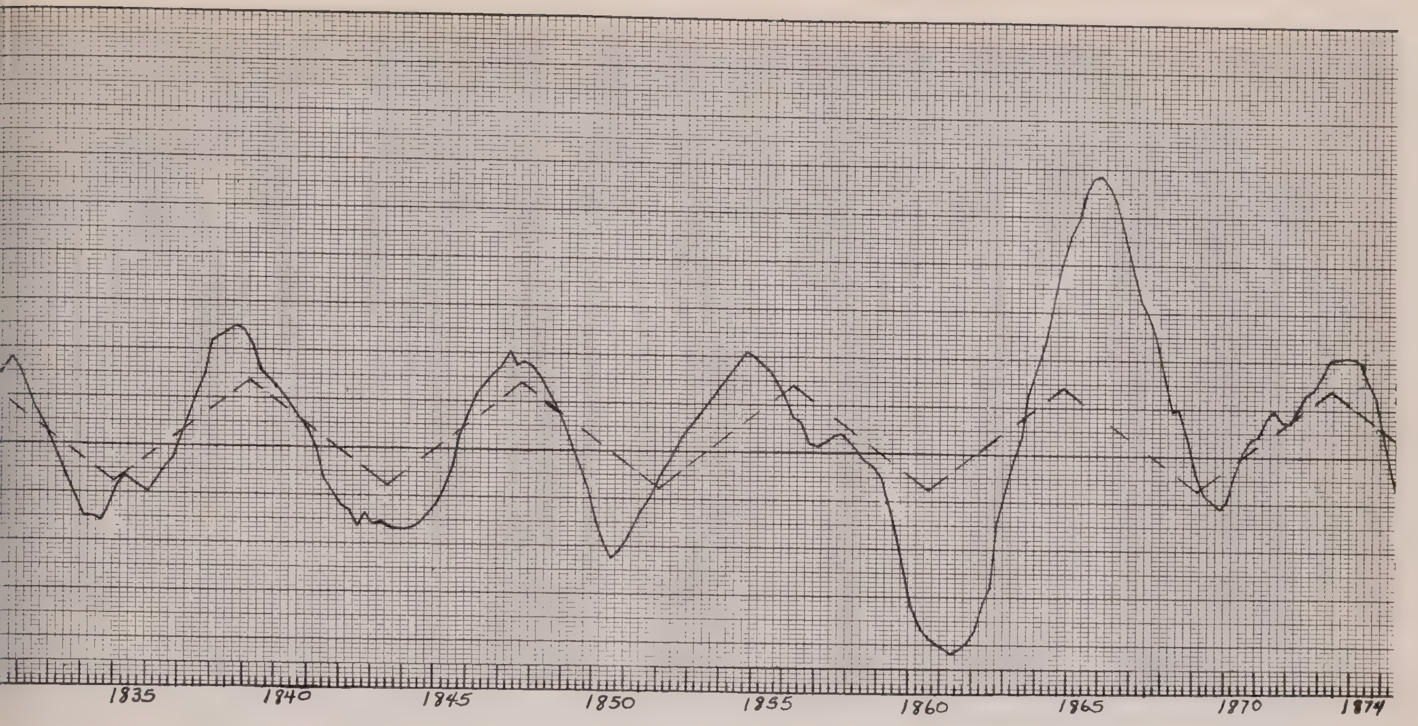


FIG. 3. (CONTINUED)

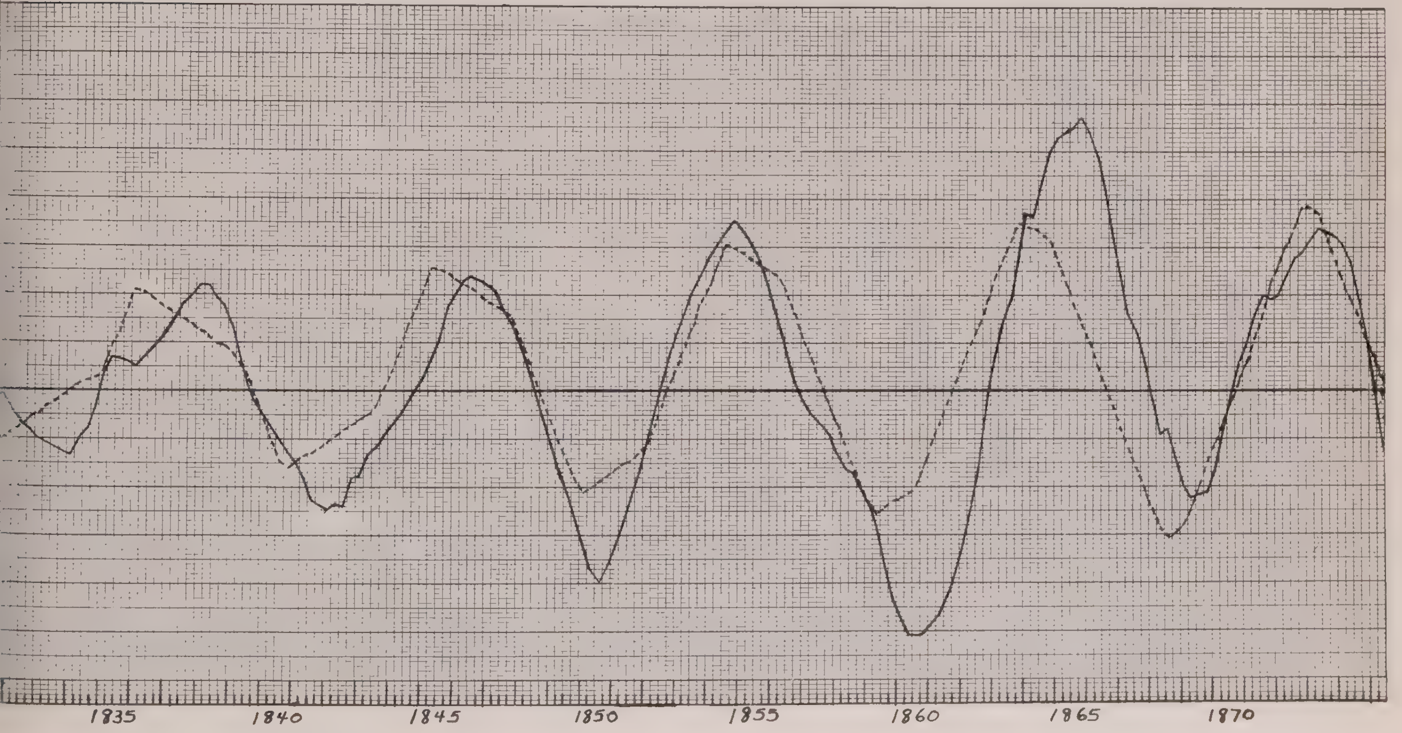


FIG. 4. (CONTINUED)

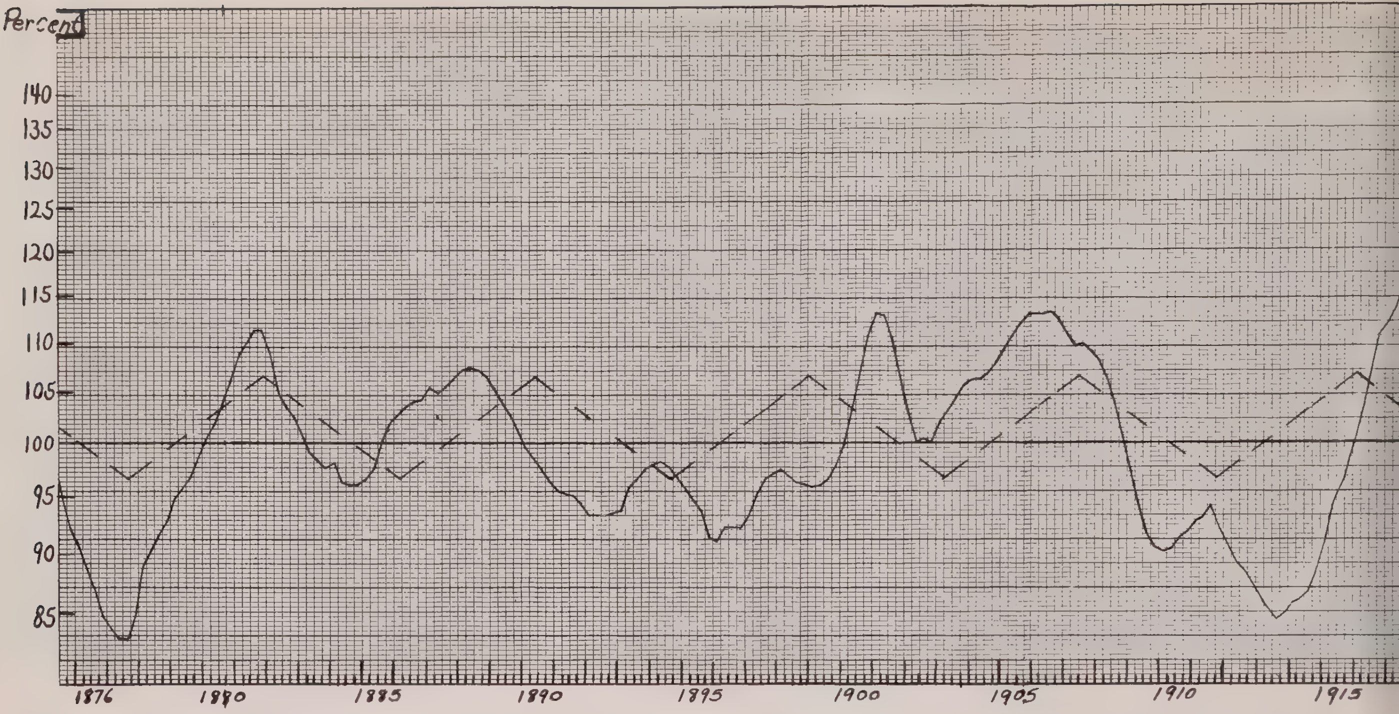


FIG. 3. (CONTINUED)

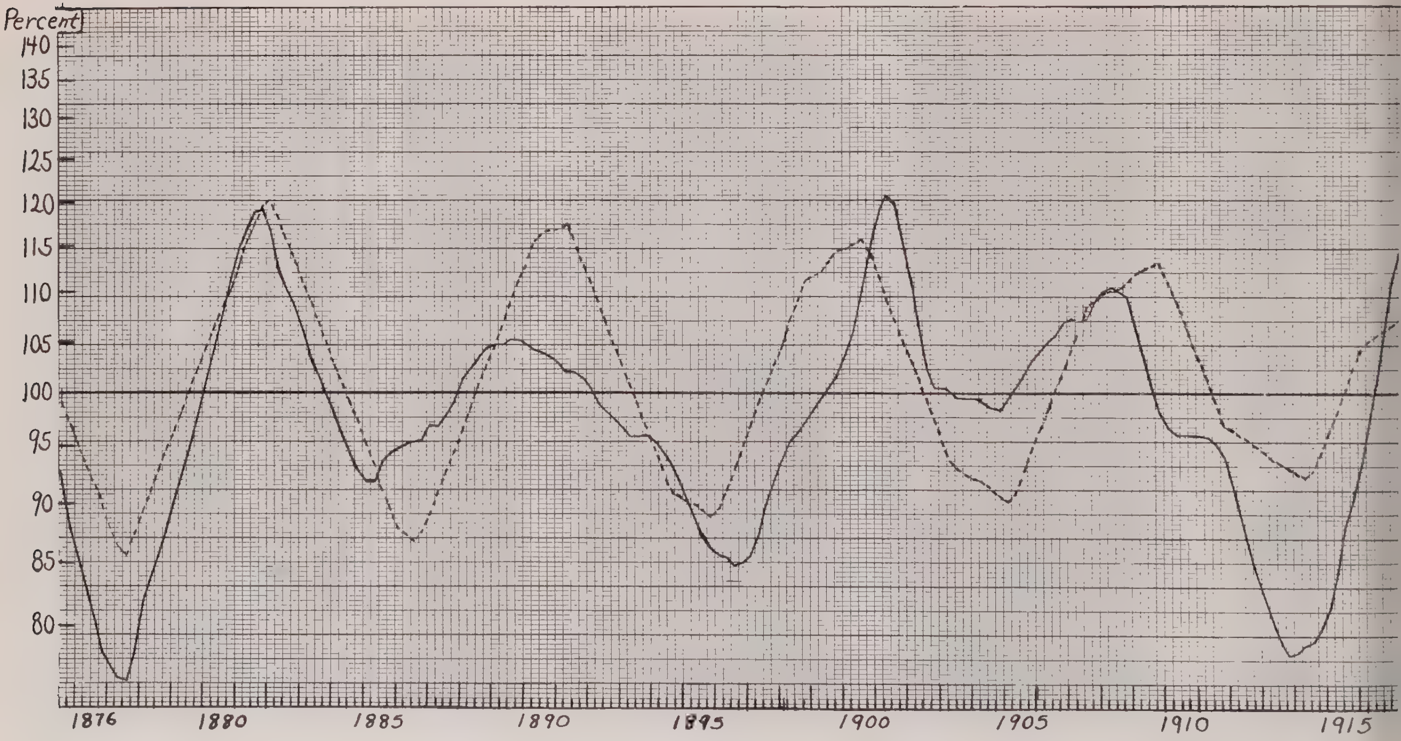


FIG. 4. (CONTINUED)

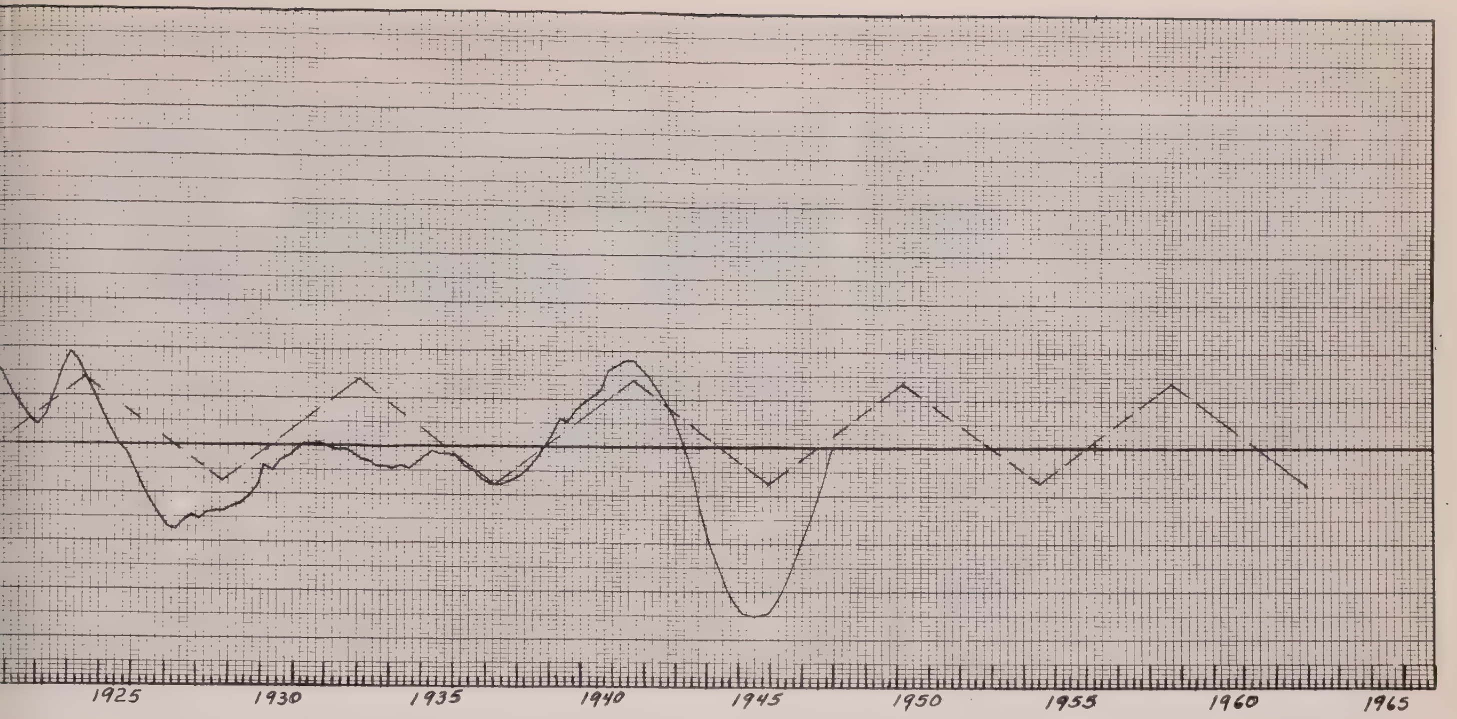


FIG. 3. (CONTINUED)

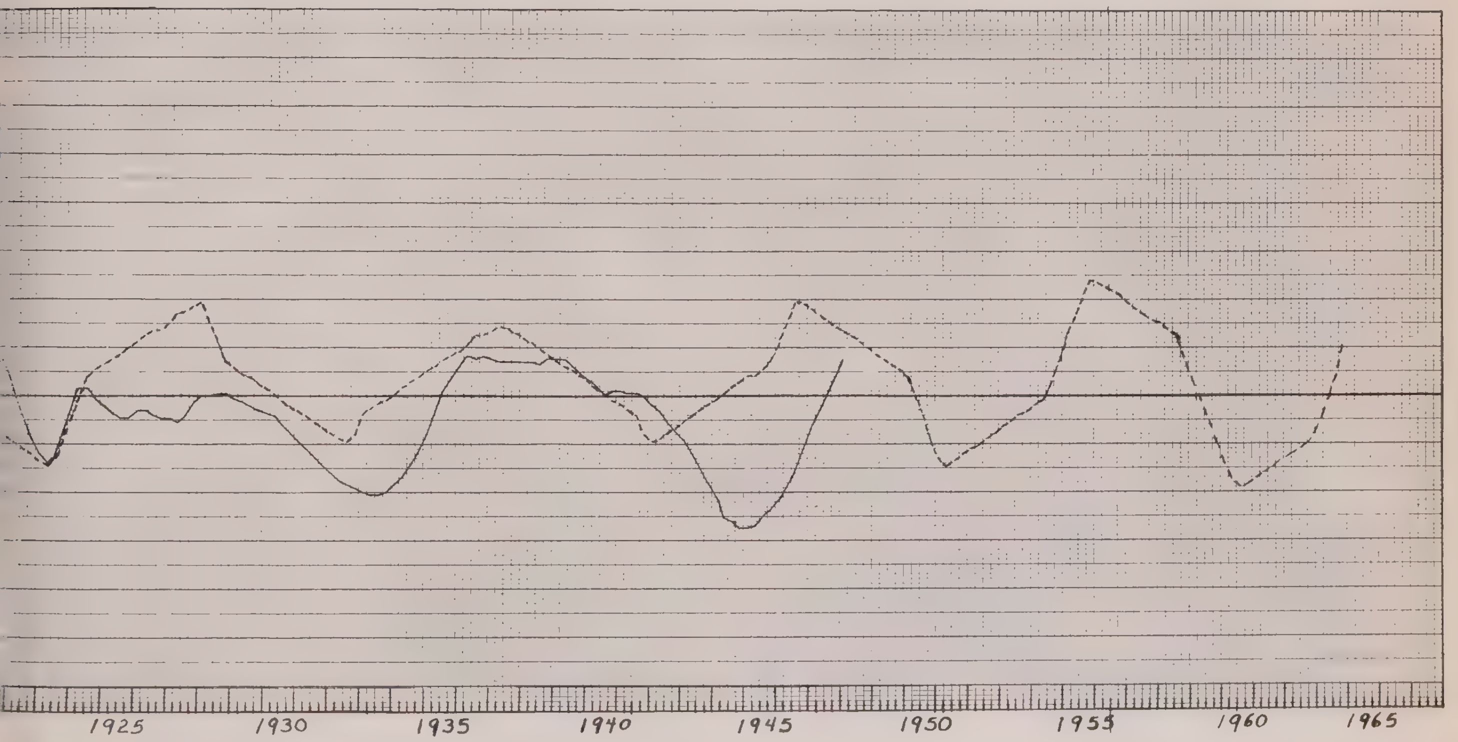


FIG. 4. (CONTINUED)

Foundation Affairs

My report to you regarding our membership plan for the year 1953 is both good and bad.

Increase of 2,699 Members

It is good because our membership more than tripled during the year. We started the year with 1,308 members; we ended with 4,007, a net increase of 2,699.

This increase is due to the unflagging zeal, energy, and ability of Mrs. Robert Roessle, manager of our New York office, and her staff. These people sent out more than 297,000 letters during the year in an effort to increase our membership.

Loss of $3,484 for the Year

The report for the year 1953 is bad because during the year the membership division lost $3,484. Receipts and disbursements of the membership division are shown below.

We have no endowment, but we were able to meet this deficit of $3,484 because of profit we made on research done on a fee basis. We made this profit in turn because I drew no salary during the year.

Statistics

Some statistics may be of interest. Our direct mail advertising costs us on the average $104 a thousand. This cost is high because we use first class postage, but experience has proved that, for us, first class postage is a must.

The average cost of putting new members on the books, taking the year as a whole, was $11.50. As each member pays $10, this means that for the first year we service the new member free and lose $1.50 to boot. If he renews, we are recouped during the second year.

Over seventy-five percent of our old members renew. How many of our new members will renew we do not yet know.

We are hoping to continue our advertising next year at about the same rate as this year. If our results are equally successful we will obtain about 2,800 new members during the year. But we must allocate about 1,800 of these new members to replace possible cancellations from last year's group of new members. This leaves a hoped for prospective net increase of about 1,000 for 1954, or a total membership of about 5,000 at the end of the year.

If we can achieve 5,000 members, and keep the membership at this level, we should be able to get and keep in the black, except for a salary to me. Maybe that too will come some day!

E.R.D.

Receipts

Renewal of memberships	$11,493.
Trial member payments	172.
Dues from new members	30,762.
Contributions from members	1,237.
Sale of publications	703.
Advertising on back cover, etc.	1,021.
Total receipts for 1953	$45,388.

Disbursements

Cost of research expressly for reports	$ 1,236.
Cost of preparing material for publication	3,189.
Cost of printing reports for members	2,999.
Cost of printing reports for future sale and printing other publications	351.
General office expense	8,125.
Direct mail advertising	30,945.
Magazine advertising	2,021.
Total disbursements for 1953	$48,872.
Net loss for the year	$ 3,484.

EXCERPTS FROM

CYCLES

THE SCIENCE OF PREDICTION

(CHAPTER VIII AND APPENDICES II and III)

by EDWARD R. DEWEY
Director, Foundation for the Study of Cycles

and EDWIN F. DAKIN
Associate, Foundation for the Study of Cycles

TOGETHER WITH 1954 SUPPLEMENT

Originally published by
HENRY HOLT AND COMPANY · NEW YORK

Copyright, 1947, by

HENRY HOLT AND COMPANY, INC.

Published, March, 1947
Second printing before publication
Third printing, April, 1947
Fourth printing, April, 1947
Fifth printing, May, 1947
ADDITIONAL PRINTING, JANUARY 1950

REPRINTED WITH PERMISSION

COPYRIGHT, 1954, BY
FOUNDATION FOR THE STUDY OF CYCLES, INC.

VIII

The 3½-Year Rhythm

Clearly indicated in the Federal Reserve Index of Industrial Production, in pig iron production, in common stock prices, in scores of other production and price series, runs a rhythm that has been variously estimated at from 39 or 40 to 42 months in length.[*] It would seem that 40.8 months is the length that provides the closest fit for many series from 1900 to date, but the true length has as yet not been determined for certain. There may be two rhythmic tendencies, for instance — one slightly over 42 months, perhaps, and one slightly less than 40 months — that combine to produce a fluctuation with a seeming length of almost 41. This 41-month rhythm has continued true from its discovery back in 1923.

It is comparatively easy to find rhythms in anything — even random numbers — although, of course, such rhythms do not occur with enough regularity or with enough repetition to justify belief in their reality. Nevertheless, it is true that rhythms in almost anything can be found after the event. If, however, the numbers are random and the rhythms are merely read into them, they will not continue as the series continues to unfold. For example, in dealing cards face up, one might get a black and a red, a black and a red, a black and a red, ten times in a row. This is a rhythm of unusual regularity, but conceivably the result of chance. If, however, having made this observation, we find that the next ten cards also come up black and red, we can begin to suspect that the cards have been stacked, and that there is a real rhythm, somehow incorporated in the arrangement.

With the rhythm that concerns us here, as with many other rhythms, thousands of hours of labor must doubtless still be spent before we can maintain more than tentative conclusions regarding periods. If now we call this rhythm one of 3½ years, it is primarily for convenience of reference. Professor Schumpeter likes to call it the Kitchin cycle, in recognition of one of the first discoverers, and observes that " the Kitchins can be best observed, for all countries, on the chart of rates of changes."

A charting of the Federal Reserve Index of Industrial Production, given in Fig. 1 with a 41-month pattern added, shows how, on an actual *production* chart, the rhythm concealed in the figures may elude the average businessman. True, there is much evidence of rhythm here, but the existence of the pattern is not obvious until it is revealed by the rate of change technique. To see this, look at Fig. 2, where these same production figures are graphed for the *rate of change*. For an example of the same kind of analysis applied to pig iron production, see Figs. 3–4.

A rate-of-change graph is based on a simple calculation. Here, instead of plotting the actual tonnage figures, the tonnage for each month is plotted in terms of its *percentage* of the figure for a previous fixed interval. For instance, on the basis of a one-year interval we would compare January with the previous January, February with the previous February, etc. This method eliminates many of the short-term variations, minimizes long-term swings, and enables us to see more clearly the variation of medium length. Percentage relationships of this kind are familiar enough. If we say that business this month is 10 per cent above business a year ago, we are using the same sort of comparison.

In Fig. 4 the agreement of the actual pattern with the ideal wave is rather astonishing, with the majority of the highs and lows coming pretty closely within the frames at top and bottom that indicate majority performance. And the points where complete agreement is lacking are as significant for our purpose as the others. Notice, for instance, the trough reached in 1908. It is delayed; it falls outside the pattern. Some force has entered the picture here which our 3½-year pattern does not account for, and the unknown force is distorting the wave. But now notice the next trough, at the end of 1910. Here our figures have snapped right back into the pattern, just as if no previous distortion had taken place. Whatever

---

[*] Professor W. L. Crum, in 1923, showed a rhythm of approximately 40 months in monthly commercial paper rates in New York from 1866 to 1922. Joseph Kitchin around the same time found the same rhythm in bank clearings, wholesale prices and interest rates, both in the United States and in Great Britain. Chapin Hoskins in early 1935, as a result of a time-chart analysis of pig iron production and many other economic series, concluded the cycle had an approximate 40.5-month periodicity. Later he came to believe the length to be 41.0 months.

Professor Schumpeter's analysis of five American systematic series gave a mean duration of 42.05 months. Armstrong of the Bell Telephone Company determined the length, in general business conditions in the United States since 1885, to be 40.78 months.

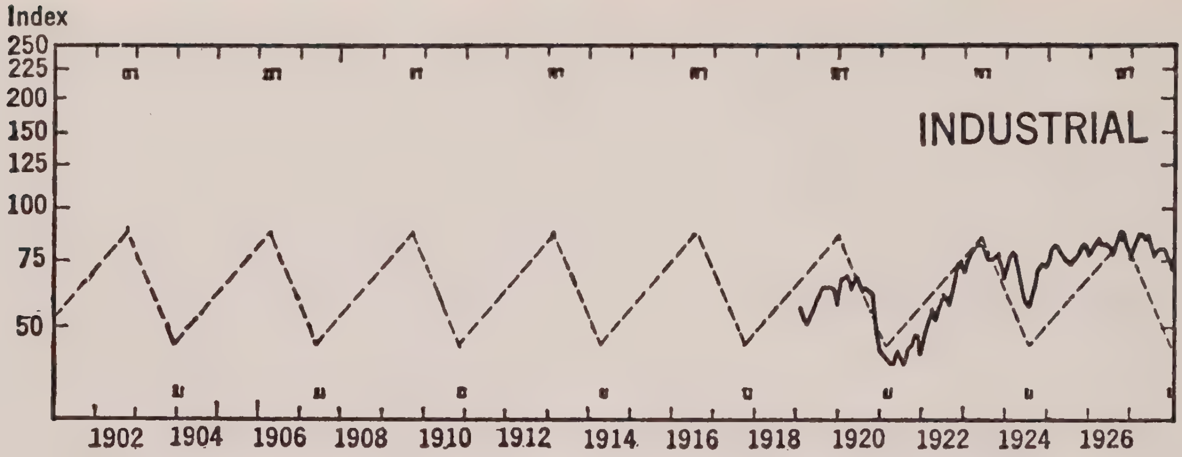


FIG. 1. THE 3½-YEAR RHYTHM

The 3½-year rhythm in the Federal Reserve Index of Industrial Production, January 1919 – December 1945. A regular 41-month cycle has been added and projected through 1954, to indicate approximately what will happen if the rhythm continues. (After Chapin Hoskins.) *Ratio scale.*

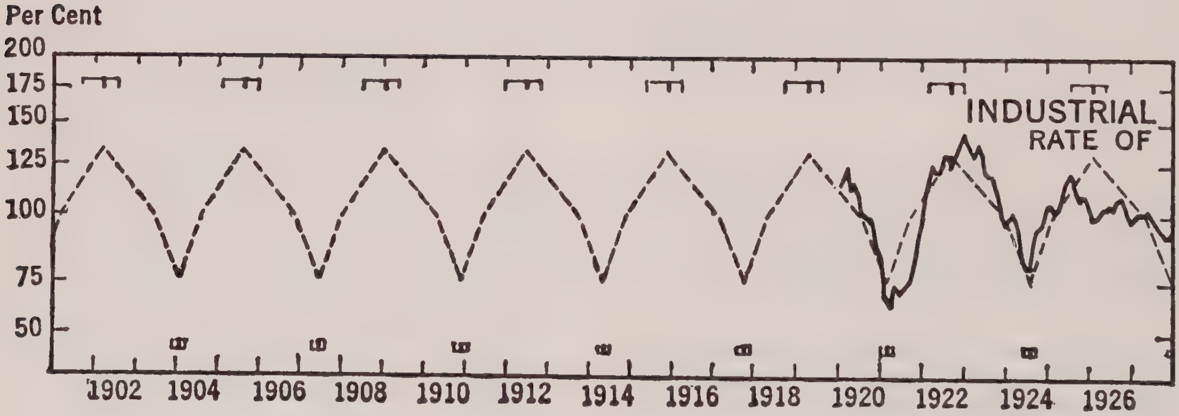
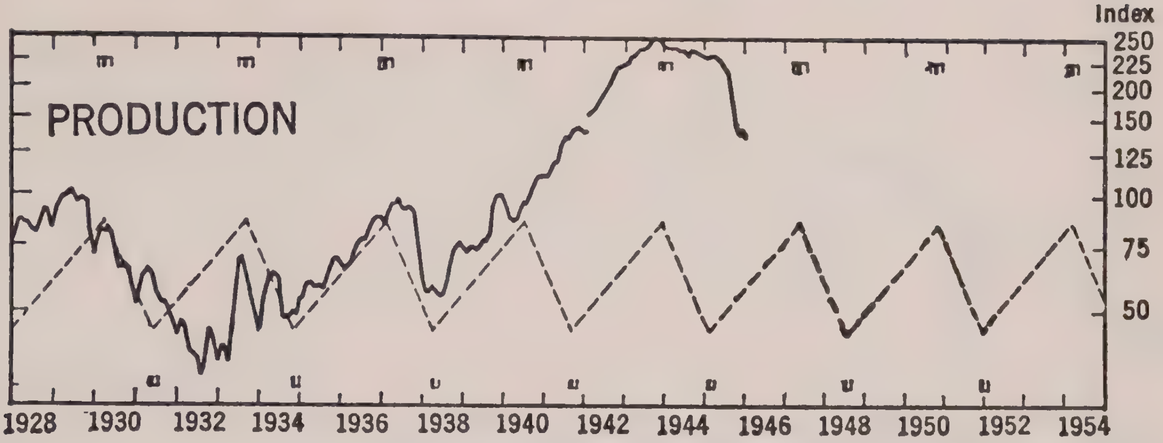


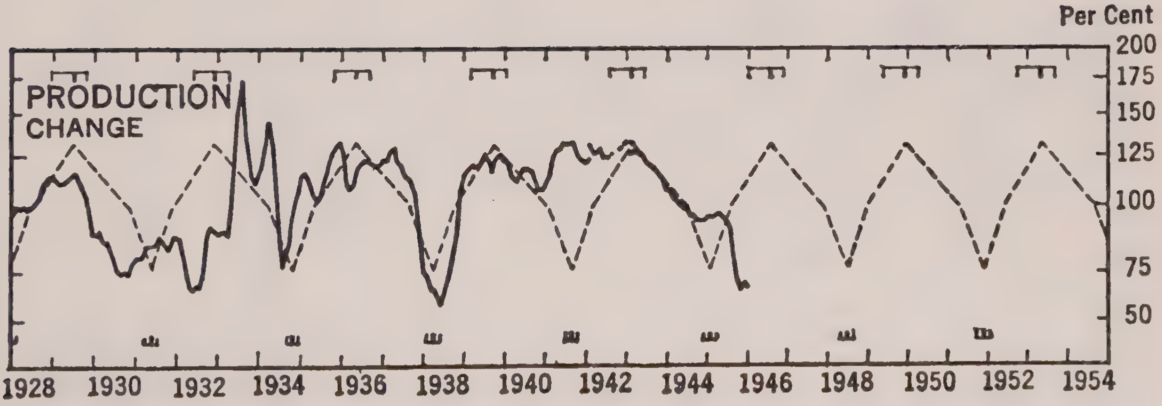
FIG. 2. RATE OF CHANGE

The 3½-year rhythm in the rate of change of U. S. industrial production, January 1920 – December 1945. Here, are charted moving percentages of the



IN INDUSTRIAL PRODUCTION

The regular 41-month cycle was determined and projected by Mr. Hoskins early in 1938. The dates for the three next ensuing highs of the projected 41-month cycle would be April 1947, September 1950, and February 1954. The two next lows of the same cycle would be June 1948 and November 1951.



IN INDUSTRIAL PRODUCTION

Federal Reserve Index of Production Figures shown in Fig. 1. A regular 41-month cycle has been added. (After Chapin Hoskins.) *Ratio scale.*

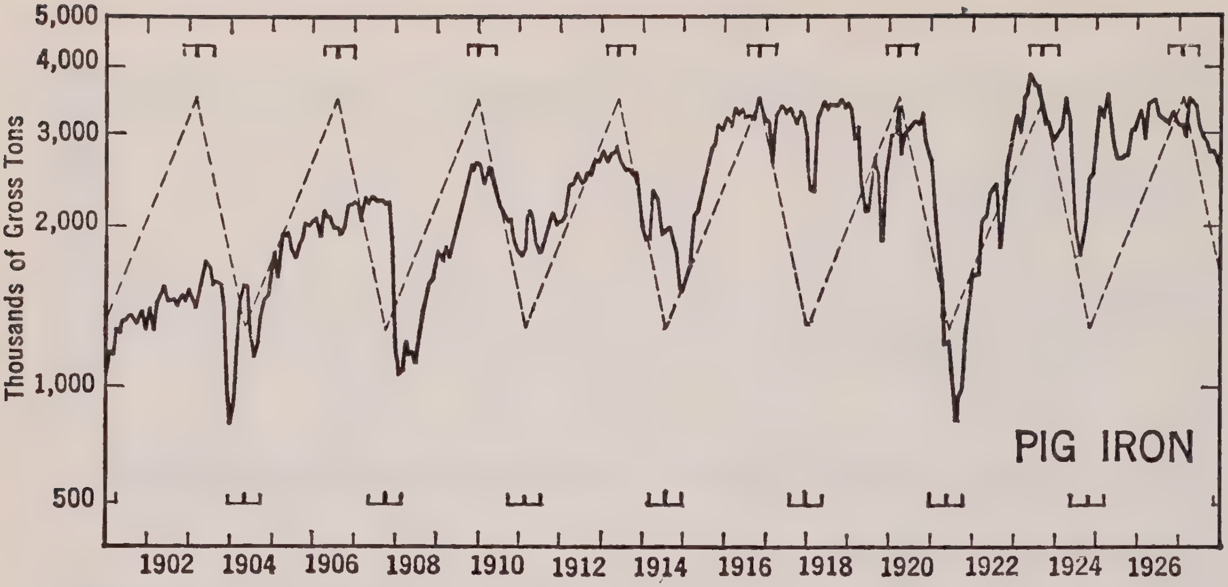


FIG. 3. THE 3½-YEAR RHYTHM

Pig-iron production in the United States, January 1901–February 1946. A regular 41-month cycle has been added and projected through 1954, to indicate in general terms what will happen if the rhythm continues.

The regular 41-month cycle was determined and projected by Mr. Hoskins

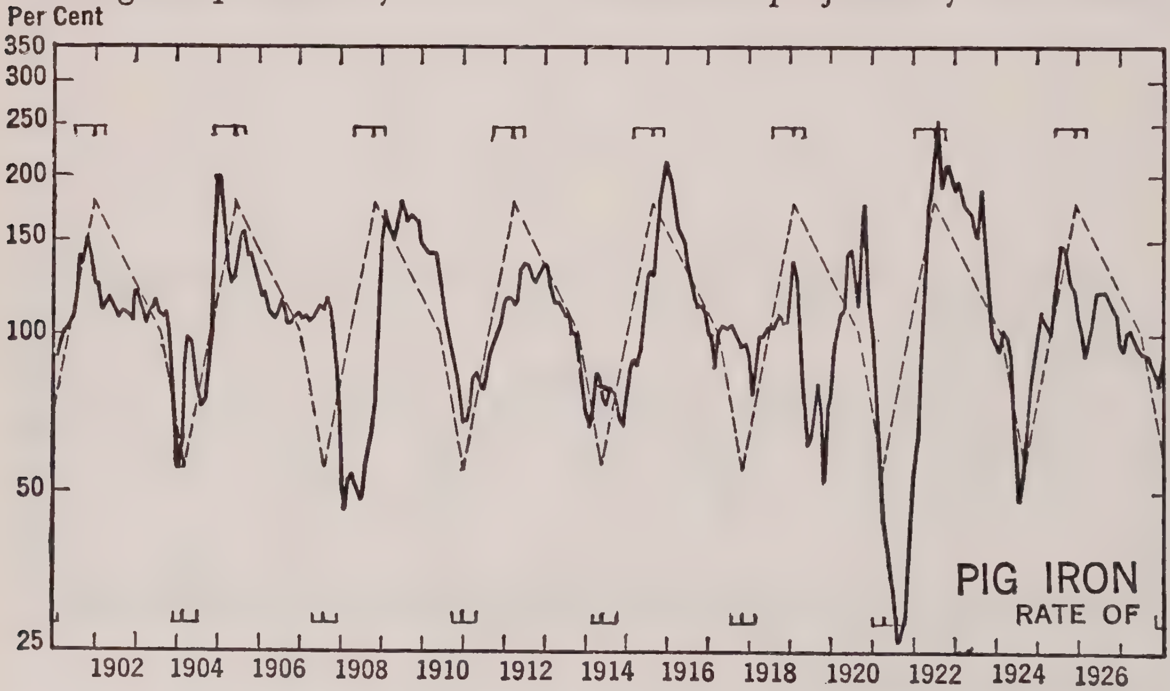
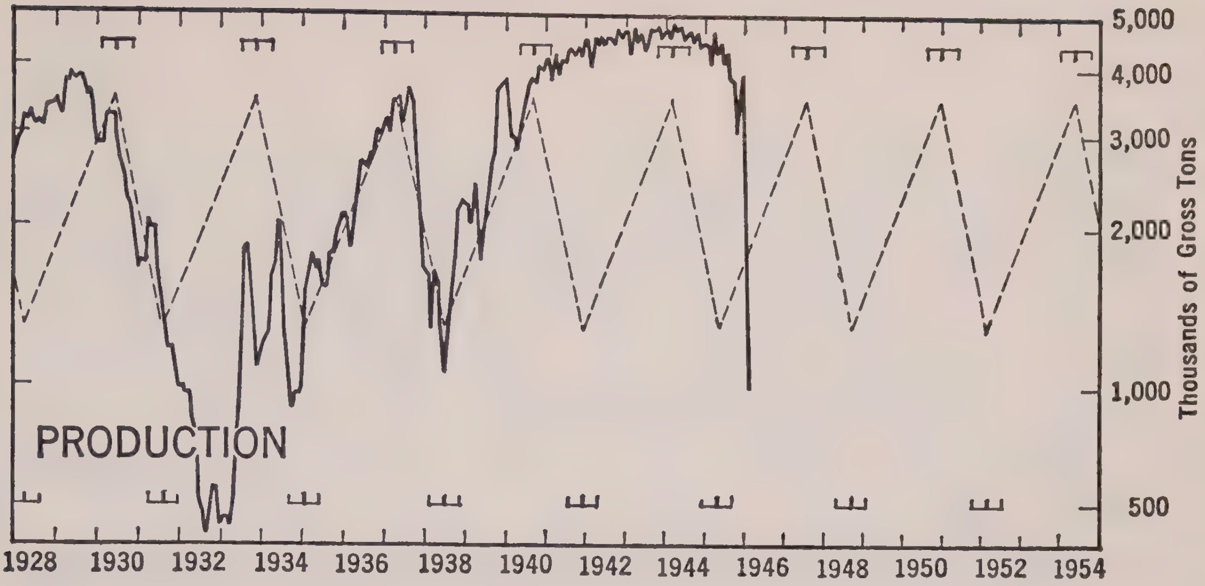


FIG. 4. RATE OF CHANGE

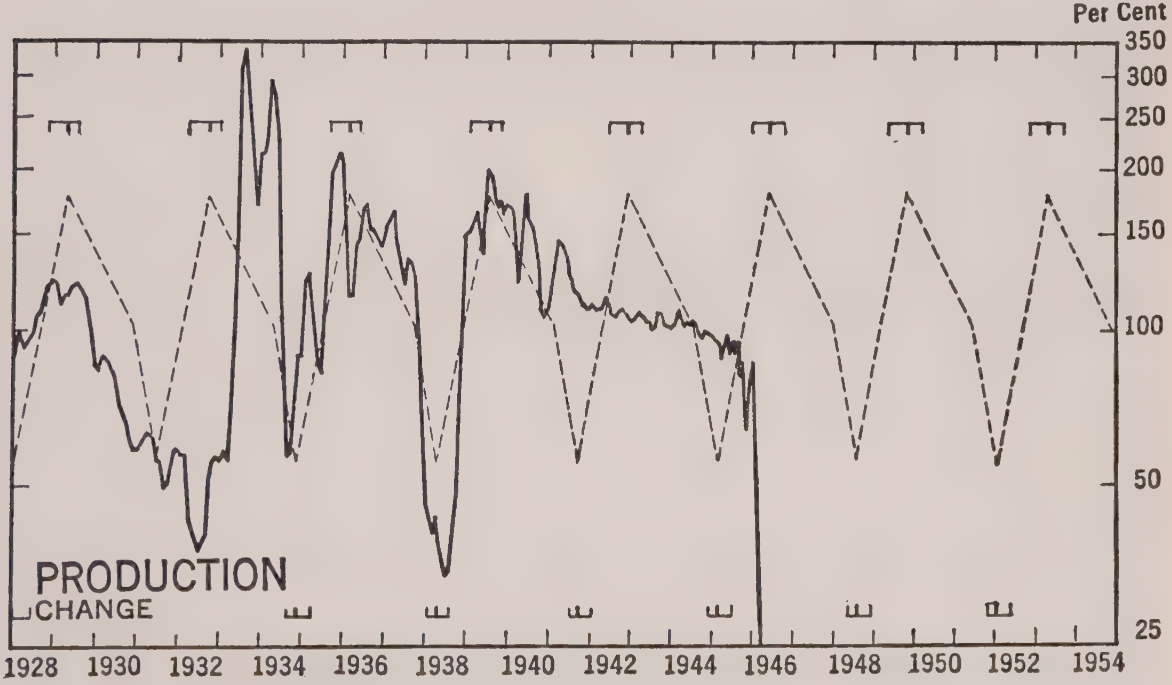
Moving percentages (rate of change) of pig-iron production, January 1901–February 1945, showing the 3½-year rhythm.

The chart shows the percentage that the actual production for each month is of the corresponding month one year before. A regular 41-month cycle has been added and projected through 1954, to indicate in general terms how the



in Pig Iron Production

early in 1938. The dates of the three next ensuing highs of the regular 41-month ideal wave are July 1947, December 1950, and May 1954. Ensuing lows in the regular 41-month ideal wave are September 1948, and February 1952. (After Chapin Hoskins.) *Ratio scale.*



in Pig Iron Production

moving percentage will behave if the rhythm continues acting as in the past.

It will be noted that the high points in the regular 41-month cycle, fitted to the rate-of-change data, are reached 14 months prior to the high in the regular 41-month cycle fitted to the actual data. The lows lead by two months. (After Chapin Hoskins.) *Ratio scale.*

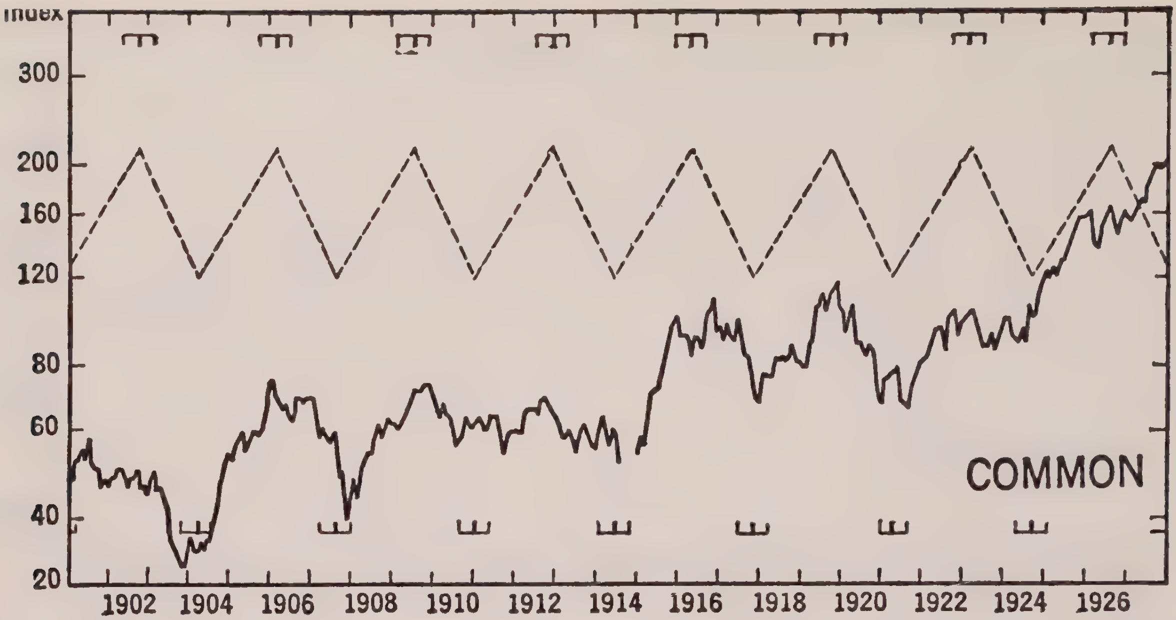


Fig. 5. The 3½-Year Rhythm

Dow-Jones industrial common stock prices, January 1901–March 1946. (Scale prior to 1914 adjusted to conform to subsequent basis.) A regular 41-month cycle has been added and projected through 1954, to indicate approximately what will happen if the rhythm continues.

This regular 41-month cycle, like the cycle in Pig Iron Production and the

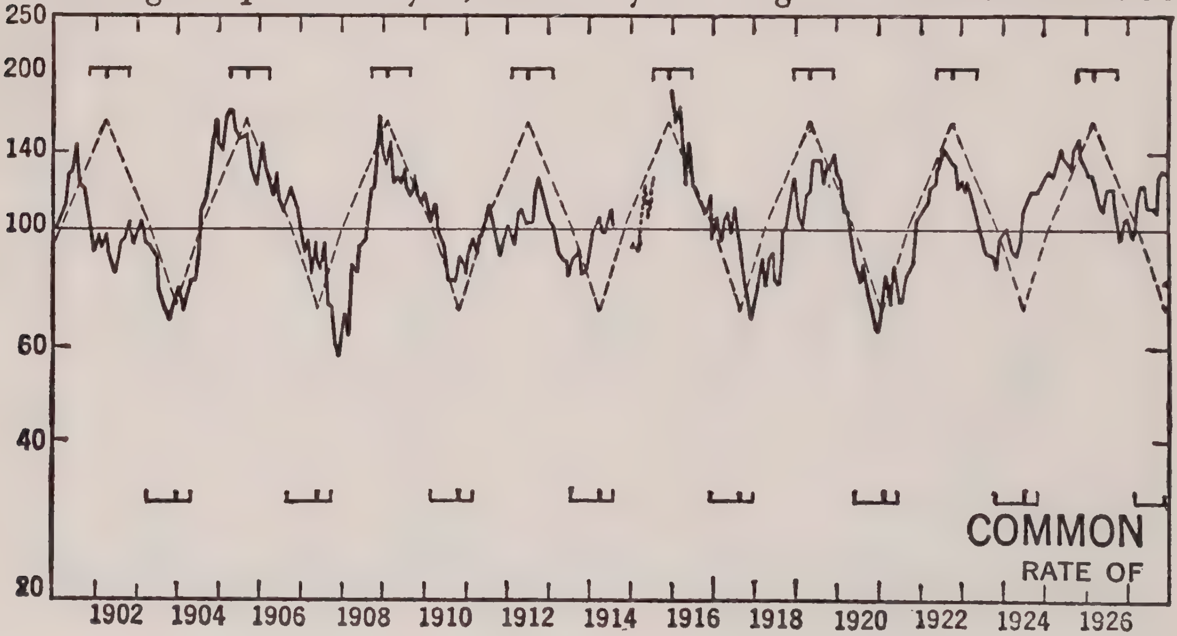
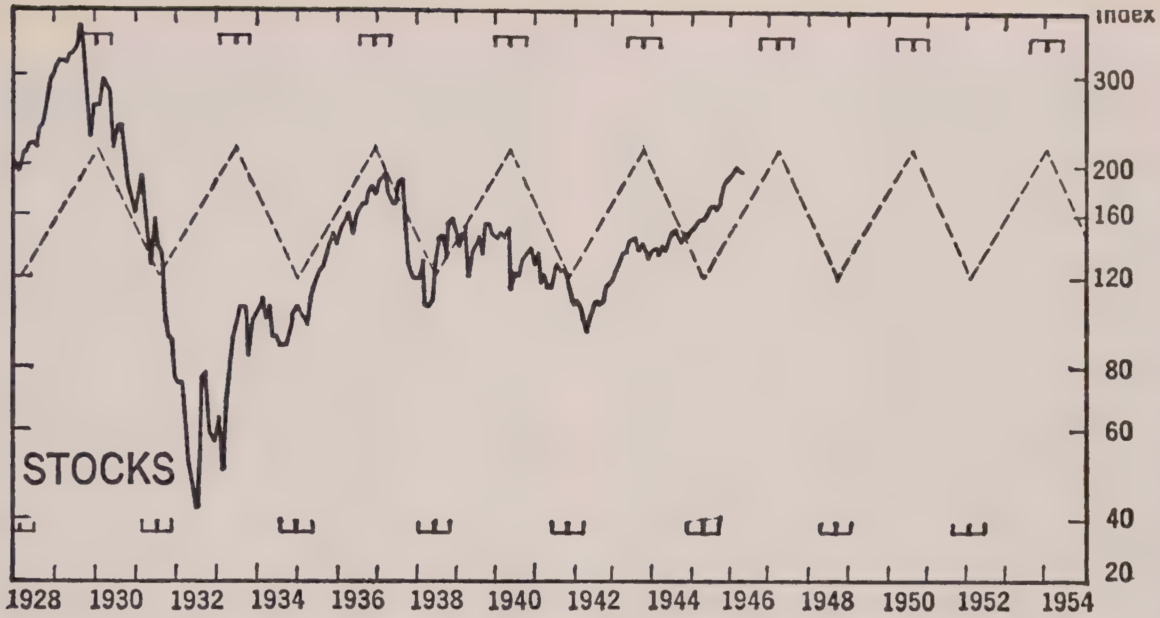


Fig. 6. Rate of Change

The 3½-year rhythm in the rate of change of common stock prices, in terms of moving percentages of the Dow-Jones Industrial Averages shown in Chart 5.

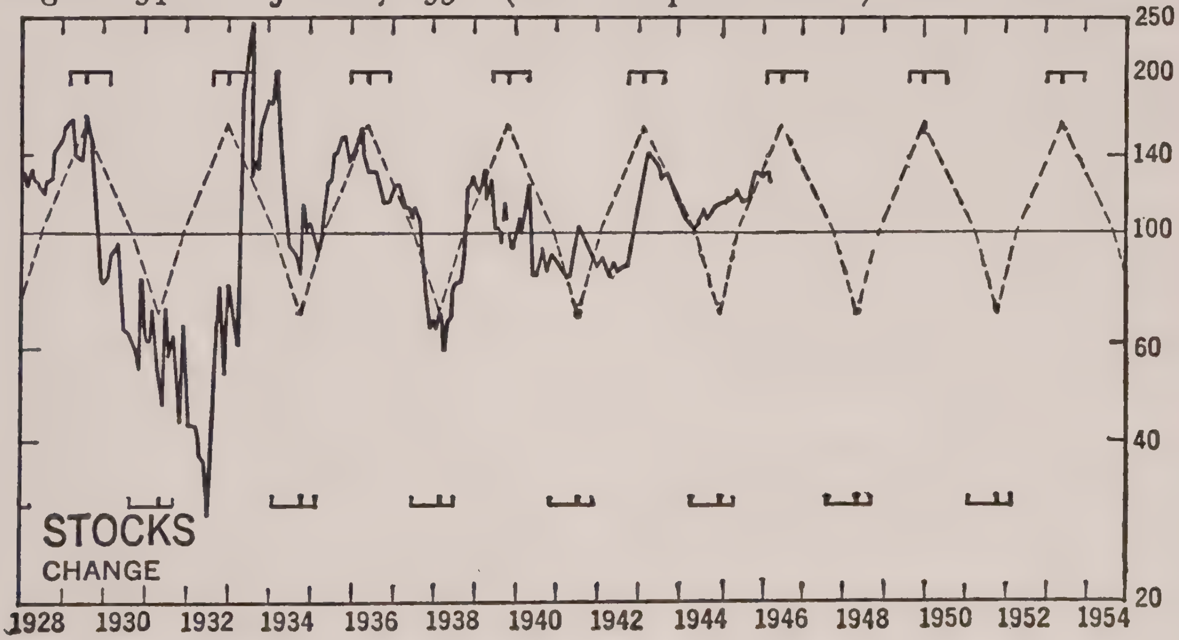
Like Charts 2 and 4, this chart shows the percentage that the actual prices of each month are of the corresponding month one year before.



IN COMMON STOCK PRICES

cycle in the Federal Reserve Index for Industrial Production, was determined and projected by Mr. Hoskins early in 1938.

The dates projected for the three next ensuing highs in the regular 41-month cycle are February 1947, July 1950, and December 1953. The two next lows are August 1948 and January 1952. (After Chapin Hoskins.) *Ratio Scale.*



IN COMMON STOCK PRICES

A regular 41-month cycle has been added and projected through 1954 to indicate approximately how the moving percentages will behave if the rhythm continues.

(After Chapin Hoskins.) *Ratio scale.*

the force that distorted the previous rhythm, it has been dissipated, and we have additional evidence that our pattern is real.

There are similar distortions in relation to the ideal pattern that called for a continuous downturn from 1919 to 1921, and a bottom in 1931. Actual performance of the real curve was distorted so that there was an extra wave in 1919–1920 — a distortion that followed the Armistice. There was also a delay in the timing of the bottom in 1932. But thereafter, following each distortion, the actual performance again falls into line with the ideal wave.

In Fig. 4, then, we have a demonstration of the way in which rhythms act, which is even more important than if Fig. 4 showed us a perfectly patterned performance. For — as we shall see — the performance on this chart shows us rhythms interacting, with, of course, chance distortions as well. Study of such interaction is the fundamental task of those today who are analyzing the rhythmic patterns in our social and economic organism. They can be studied both in the rate-of-change figures and in the actual figures of which the rate of change is the counterpart. It is to be hoped that some of our great basic industries, like steel, which affect with their operations the life of our whole economy, and which have at stake such great investments in this economy, will eventually lend encouragement and support to research of this order.

Steel is, of course, an involved industry. To establish within any degree of accuracy the periods of the many rhythms which affect its operations would require extensive research. Not only is the industry evidencing the 54-year, 9-year, and 3½-year rhythms we have been tracing; it also shows evidence of the 18-year rhythm we shall shortly meet operating in other important industries; and there is further evidence that it involves rhythms of around 6, 7½, and 15 years, along with shorter rhythms of 6, 9, 24, and 33 months.

Regardless of the amount of work yet to be done on the problem, the cursory data we already have in hand are useful enough to suggest that a search for more would be well warranted. As late as midsummer of 1944, for instance, an iron and steel trade journal was debating whether the industry's capacity would be sufficient to meet the postwar demand for steel. No one familiar with the postwar implications of the various cycles, in combination with the industrial trend lines we have explored, could be seriously concerned with such a question until after the half-century mark, at the earliest.

Interestingly enough, the 3½-year rhythm which we see in pig iron production is also duplicated in scores if not hundreds of other economic phenomena, including stock prices, where peaks tend to come about five months earlier, and valleys one month earlier, than in pig iron production.

The existence of this same rhythm in stock prices is provocative. (See Figs. 5–6.) Iron is a tangible commodity, a thing, a visible reality that would exist in some form or other if no man had ever been on earth, or if all men disappeared. But stocks and prices have a different sort of reality. A stock certificate is a slip of paper which depends for its being on states of mind; whatever the assets behind it, only the mind can provide a link between them and the paper. Further, prices also have a basic reality that is purely mental, for — regardless of what the figures be that prices are quoted in — the figures can only be an index to a mental attitude focused as desire. Stock prices reflect, far more than some commentators ever pause to realize, the psychological states prevailing in a community.

The stock market which has rhythms is not located in Wall Street. It is only an expression of ideas, and ideas are expressions of people. If there is rhythm in the action of the market, it obviously must spring from the fact that the rhythm is flowing in the human organism. In studying the market we are studying men, and studying them in one of the fundamental aspects of their nature.

As a study for exploration, the questions regarding the nature of reality and its relation to the mind have been left by the economists largely to the philosophers, and perhaps to the psychologists. But, in an era where all the sciences are drawing closer together, the economist has much to gain by building on the accumulated lore of other fields of study he has often been too busy to investigate personally. We may recognize, at least, that what we see in Fig. 5 is primarily — in at least one sense — a community psychological chart.

Figure 6 shows the rate of change in the Dow-Jones index of industrial common stock prices, together with the tracing of an ideal 3½-year (i.e., 41-month) wave. Note, first, the distortions in the 1932–1933 period, when both trough and crest were delayed. Here we find a delay quite parallel to the lags in the pig iron production chart. The circumstances also are parallel.

On the whole, the impression this chart leaves us with is one of amazing regularity, with the majority of troughs and crests alike closely associated with the ideal pattern as shown by the dotted lines. Where the departures from the pattern do show up, we have other data that go far to explain the deviations in terms of interacting waves of other periodicities. And insofar as these other waves are rhythmic, they are presumptively predictable.

One point of historic interest may be mentioned in connection with the divergence from pattern at the end of 1926. Note that around the beginning of 1927 the actual wave halts in mid-air, as it were, while on its way down. It fails to continue on to the trough, but starts mounting — nearly a year earlier than the ideal pattern called for — to the peak that we know was reached in 1929.

The other forces meeting at confluence in this period proved overpowering in 1927 so far as the short 3½-year wave was concerned. Thus in early 1927, instead of continuing downward to its year-end trough, as would have happened in following its ideal pattern, the market started mounting. And it kept climbing until it had almost reached its patterned crest in 1929.

A rather similar divergence in market action from the pattern called for by the 3½-year wave occurred in 1944. At that time, instead of falling into a trough, as the projected pattern would have forecast, stock market averages showed buoyancy. We may postulate that in 1944, as in 1927, it was an extraordinary inflationary force that kept the market steady when the pattern called for decline. In 1945, as in 1928, when the pattern again called for a rise, the inflationary forces still present made that rise almost meteoric.

This rise continued in the stock market, with few interruptions, until the turn-down in the ideal 9-year wave came in mid-1946. The ensuing break in the market in August-September is history. The 1946 break came just after the 9-year wave started receding, although the shorter $3\frac{1}{2}$-year wave was still mounting.

When the time comes in early 1947, as then indicated by the projected pattern, for the $3\frac{1}{2}$-year wave to turn down again, and add its down-thrust to that of the 9-year rhythm, observers will be interested in watching to see whether post-1929 history is approximately paralleled.

It has already been stated that in the early forties our charts enabled one to foresee a very substantial and heady rise in stocks and commodities into 1946. Those who look back from the vantage point of subsequent history may have occasion to note that the inflation of the forties only added to the tolling of the bell when 1950 came. For — to repeat — with the 9-year rhythm turning down in 1946, and the $3\frac{1}{2}$-year rhythm scheduled to turn down in 1947, the market will then be left with no dominant rhythm to support it — at least, none that we have traced.

Whatever the war leverage amounts to up to 1947, we may postulate tentatively that its inflationary force can hardly act after that year, when there will be no major market rhythm to act through.

Many volumes have, and will be, written on the subject of interpreting stock market patterns. Here only the most cursory illustrations can be given of the way in which the major economic rhythms may be seen at work in the market's operation. Our patterns show up clearly here, as elsewhere; the $3\frac{1}{2}$-year wave is one of the most important among them; and the incidence of such events as wars and war inflation, though it may distort the wave, does not fundamentally change the pattern.

Out of more than 500 different kinds of economic series that have been analyzed by various research workers, something more than half show fluctuations which are of the $3\frac{1}{2}$-year interval type. Many of these can serve as extremely useful barometers, not only in the stock market but in many other economic organizations — particularly when the shorter waves are viewed in connection with the longer rhythms, and what we have learned about their working is applied to the interpretation.

One danger should be emphasized. This, strangely enough, is the danger of traditional "thought." The average businessman who uses rhythmic patterns to guide his planning is using an instrument so foreign to his ways of *thinking* about his work that he may let faulty judgments interfere with accurate reading. Most of us, taught to think in conventional terms of cause and effect, and trained in a system where the educational wares are often cut to the lowest common denominator of mass intelligence, find it hard to remember that the human mind is very finite. It can never hope to grasp in any situation all the causes that may work together to produce any given result. That is why judgments are so faulty when we reason solely on the ordinary cause-and-effect basis. Some if not most of the actual causes will escape our knowledge, and those we do take into calculation may be pure assumption. If despite this we reach a correct conclusion, it is a triumph of accident — or of intuition.

Awareness of economic patterns, and such knowledge as we can gain of their operation, helps avoid some of the pitfalls inherent in the limitations of our ability to think accurately about the infinite world that surrounds us.

Readers willing to pursue further some of the problems inherent in cause-and-effect thinking will find Chapter XIII devoted to the subject.

1954 POSTSCRIPT TO CHAPTER VIII

I am more than ever convinced that the 3½-year cycle, which dominated the fluctuations of so many series of figures for so many years, is *not* the result of random forces. I am sure that it is significant.

On the other hand, I have become equally convinced that these fluctuations are not the result of a simple rhythmic force of the observed length, but rather that they are the result of the interplay of several (probably four) cyclic forces, all of this general order of magnitude. This means that the resultant 3½-year cycle will fade out as the different component cycles pull apart.

My increased belief in the significance of the 3½-year cycle is based on the following evidence:

1. I have learned that this cycle was discovered as long ago as 1909 (see our report for April 1952, page 152), and rediscovered in 1912 (see our report for November 1951, page 327). Therefore, the dramatic adherence to the pattern for the ensuing 30 years, as shown in Chapter VIII, occurred as a *fulfillment of a forecast*. That is, the cycle continued for 30 years after discovery.

2. I have found traces of cycles of this order of magnitude in pig iron prices and in copper prices over the entire span of 170 years for which monthly figures are available, and in cotton and in wool prices from 1731 and 1816 to date respectively.

3. In certain series of figures a cycle of this general order of magnitude has continued up to the present time.

It is inconceivable to me that this behavior can be the result of random forces.

On the other hand, it is clearly evident that the 3½-year cycle no longer dominates the medium term fluctuations of many series of figures, particularly the stock market.

In this connection, refer to Fig. 1 below which brings up to date Fig. 5 in Chapter VIII, and Fig. 2 on the following page which brings up to date the rate of change curve, Fig. 6, in the same chapter.

If there is any 41-month cycle in either of these two curves it is not visible by casual inspection.

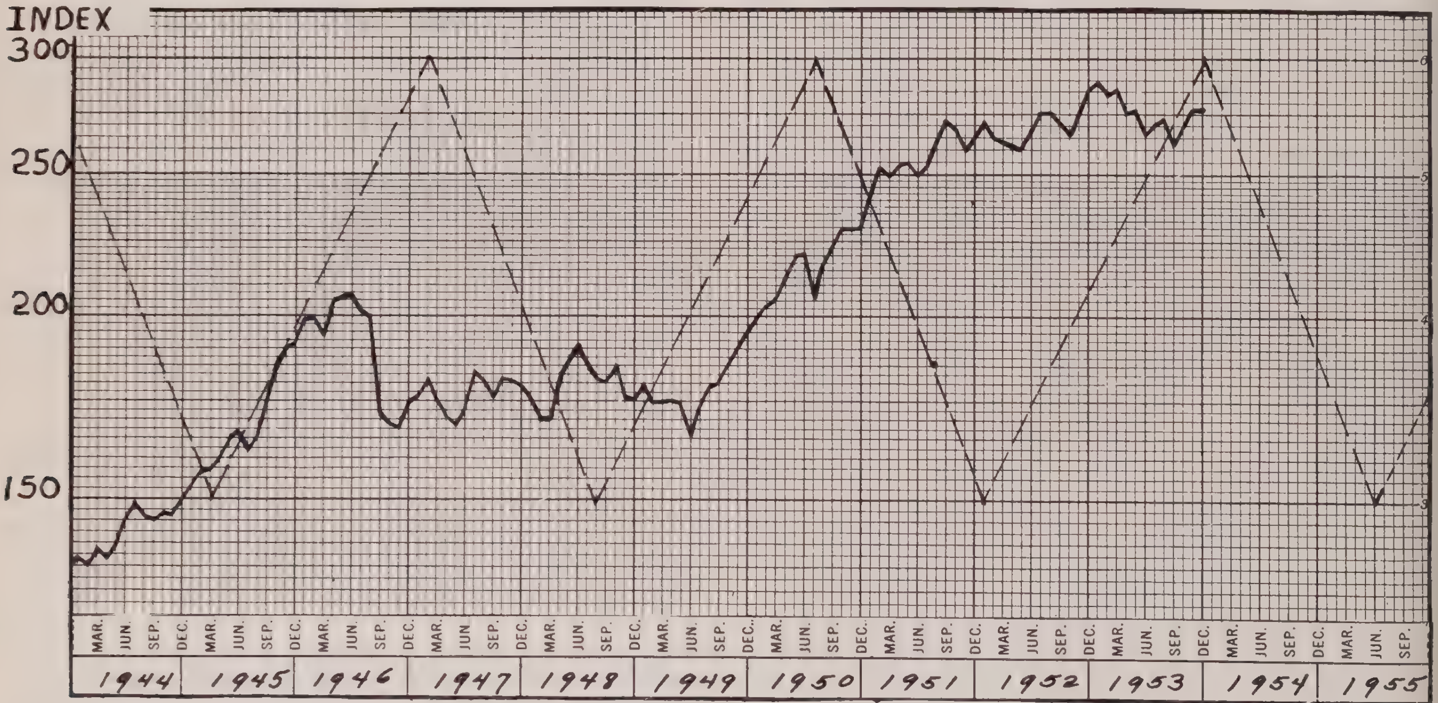


Fig. 1. Common Stock Prices, 1944—1953. This chart is a continuation of Fig. 5 of Chapter VIII. It is on ratio scale. The 41-month cycle, if present, is not strong enough to be seen by inspection.

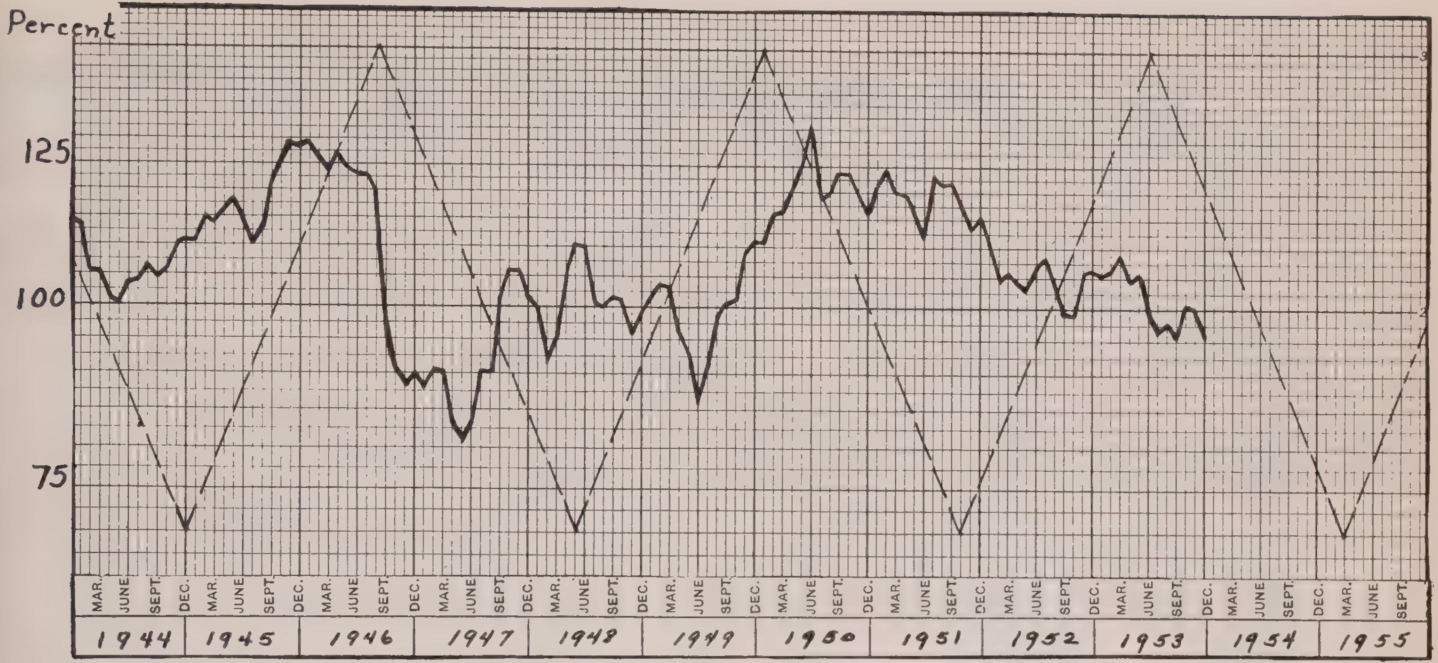


Fig. 2. Rate of Change in Common Stock Prices. This chart is a continuation of Fig. 6 of Chapter VIII. t is on ratio scale. The 41-month cycle, if present, is not strong enough to be seen by inspection.

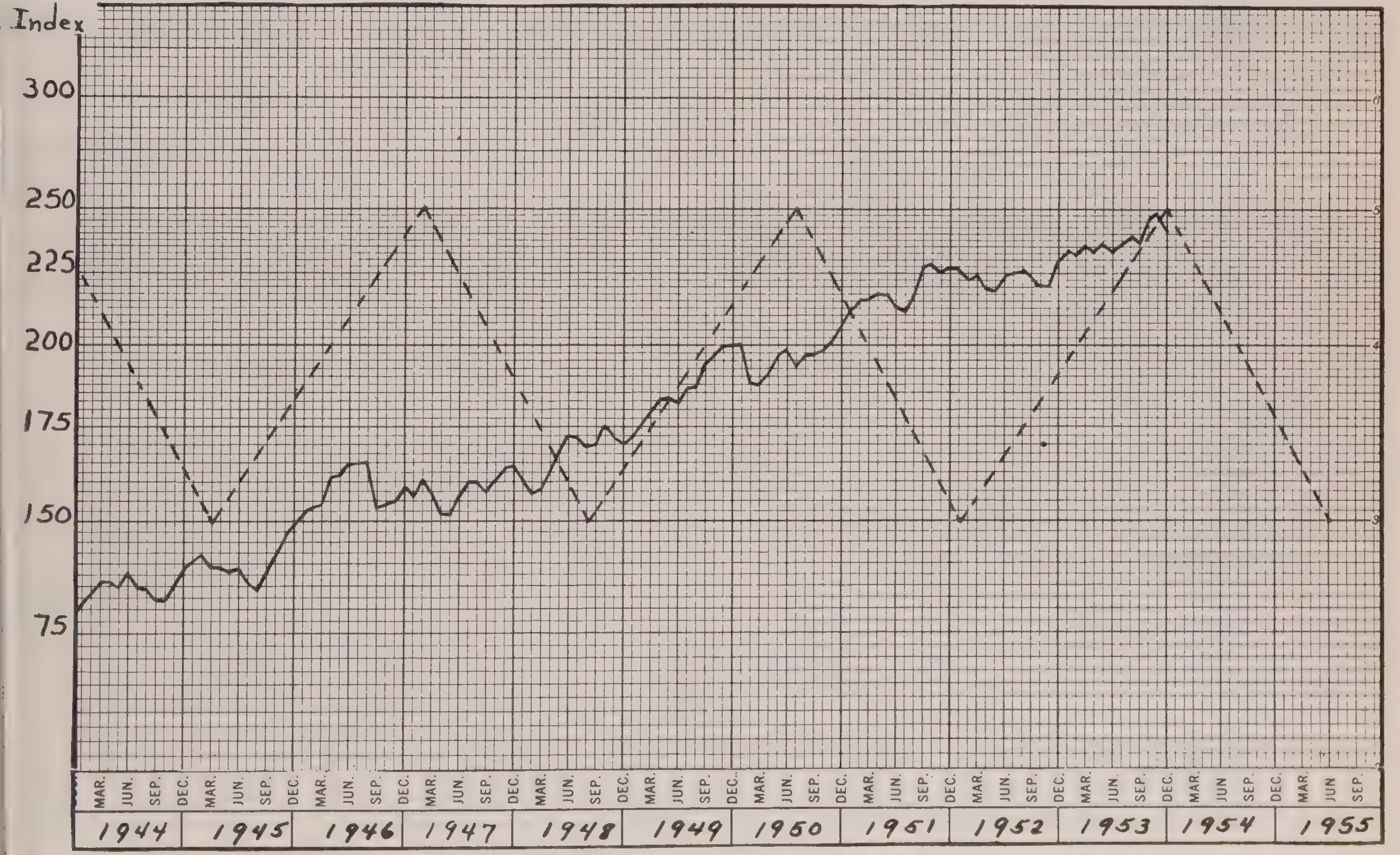
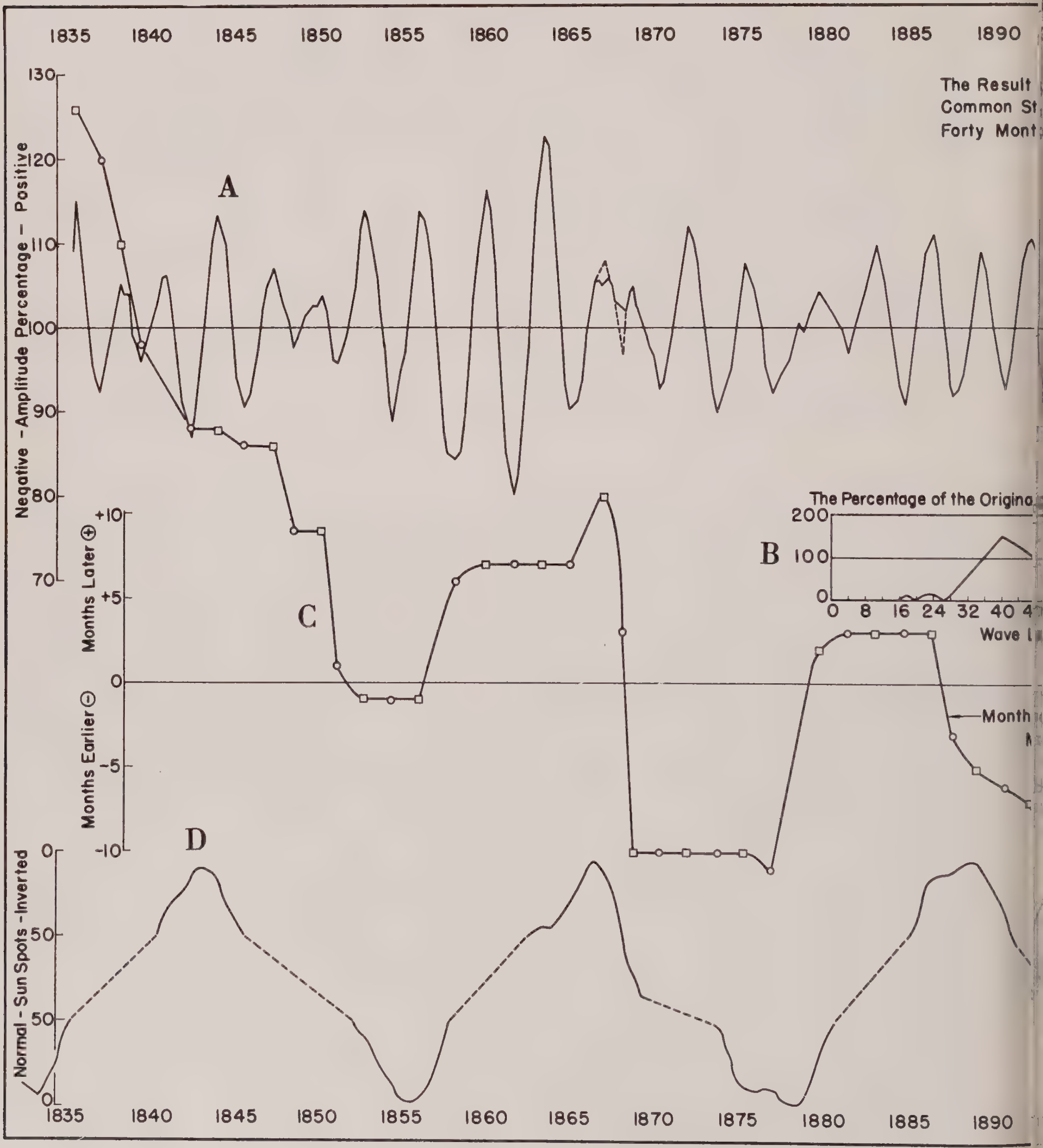
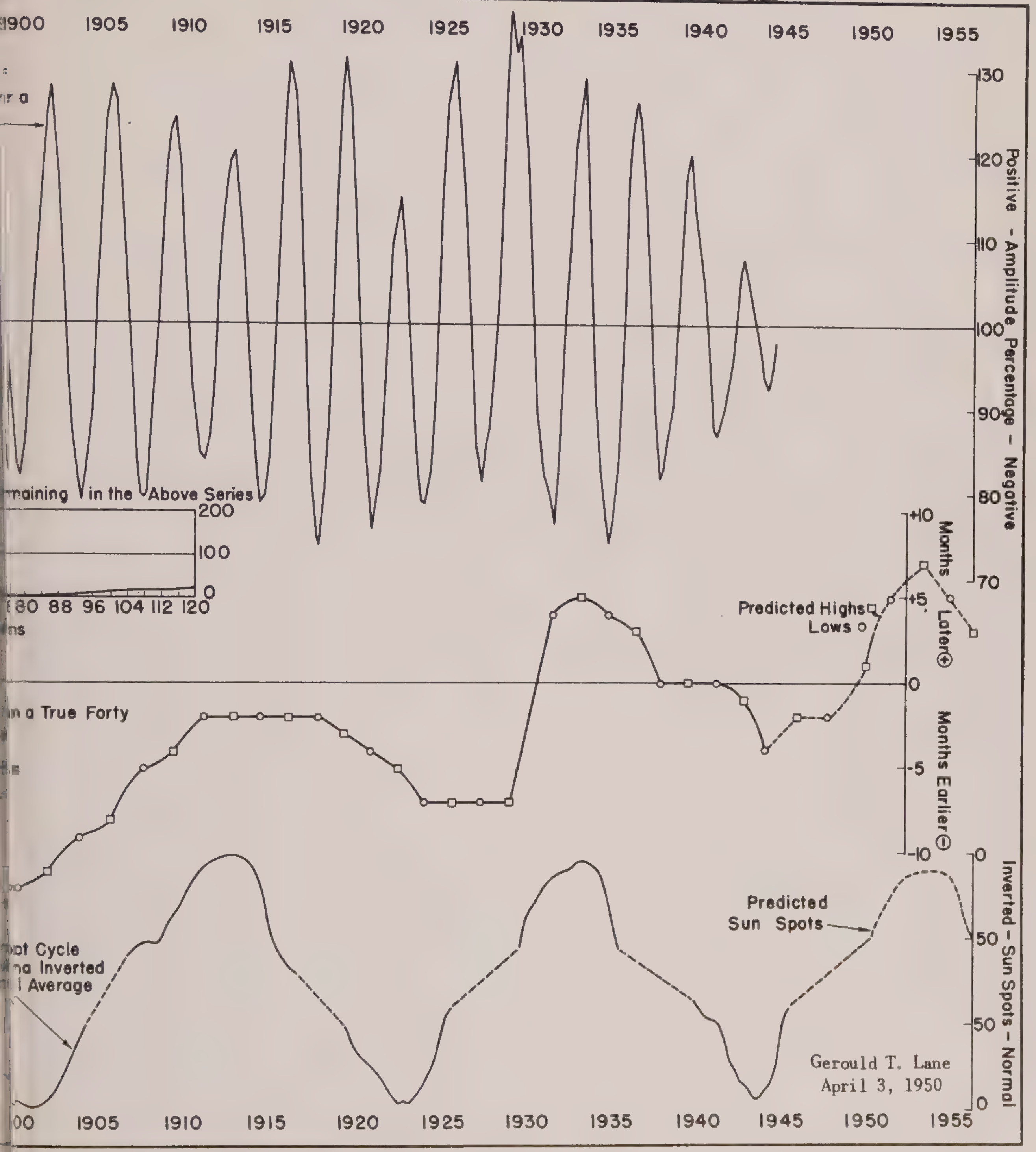


Fig. 3. Common Stock Prices Filtered to Show Any 41-Month Cycle Present. This chart is a two cycle -month section moving average of the values shown in Fig. 1 above. See text for explanation. It is on tio scale. From this chart it is clear that the 41-month cycle in common stock prices has disappeared.

Fig. 4. The Forty-Month Cycle in Common Stocks and



iation in Length During Alternate Sunspot Cycles



Gerould T. Lane
April 3, 1950

The extinction of the 3½-year cycle in common stock prices was forecast by Mr. G. T. Lane in a talk he gave to the members of the Foundation for the Study of Cycles on May 2, 1950.

Lane's work consisted of an ingenious manipulation of common stock price figures which had the effect of magnifying waves of the general neighborhood of 40 or 41 months, of minimizing longer and shorter waves, and of eliminating trend. The manipulated figures therefore show the 41-month waves much more clearly than they can be seen in the raw data. Mr. Lane's chart consisted of four curves which I have labeled A, B, C, and D. It is reproduced overleaf on pages 110 and 111.

Curve A represents common stock prices from 1831 to 1950 manipulated in such a way as to emphasize the cycles in the general neighborhood of 40 months. The manipulation, like a moving average, loses some values at each end and, therefore, the actual curve extends only from 1835 to 1944.

The second curve labeled B shows the effect of Lane's manipulation upon all cycles from 16 to 130 months in length which might have been present in the original figures.

The third curve, labeled C, shows the number of months variation from a true 40-month cycle. You will observe that this variation itself is rhythmic and that it shows a cycle on its part of 22 to 25 years in length.

For purposes of comparison Mr. Lane has added a chart of the double sunspot cycle with alternate minima inverted which I have labeled D.

For complete details regarding Mr. Lane's method of filtering refer to reports of the Foundation for the Study of Cycles for June 1950 and December 1951.

To see whether or not there is any vestige of a 41-month cycle remaining or if this cycle is beginning to reappear upside down, as we might expect from Mr. Lane's chart, I have

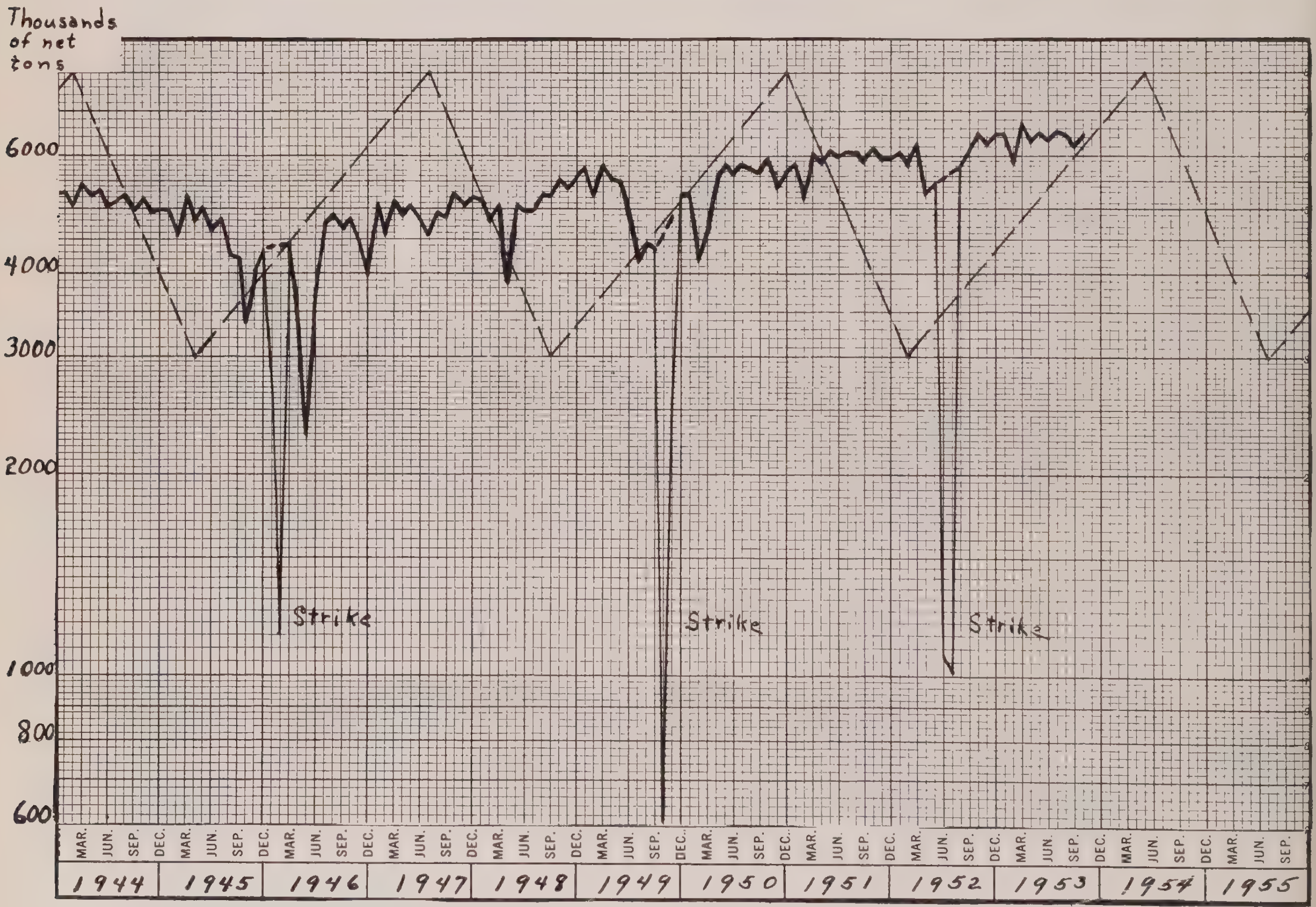


Fig. 5. Pig Iron Production, 1944—1953. This chart is a continuation of Fig. 3 in Chapter VIII. It is on ratio scale. The great dips in 1946, 1949, and 1952 reflect the strikes of these years. It is difficult to see the 3½-year cycle by inspection.

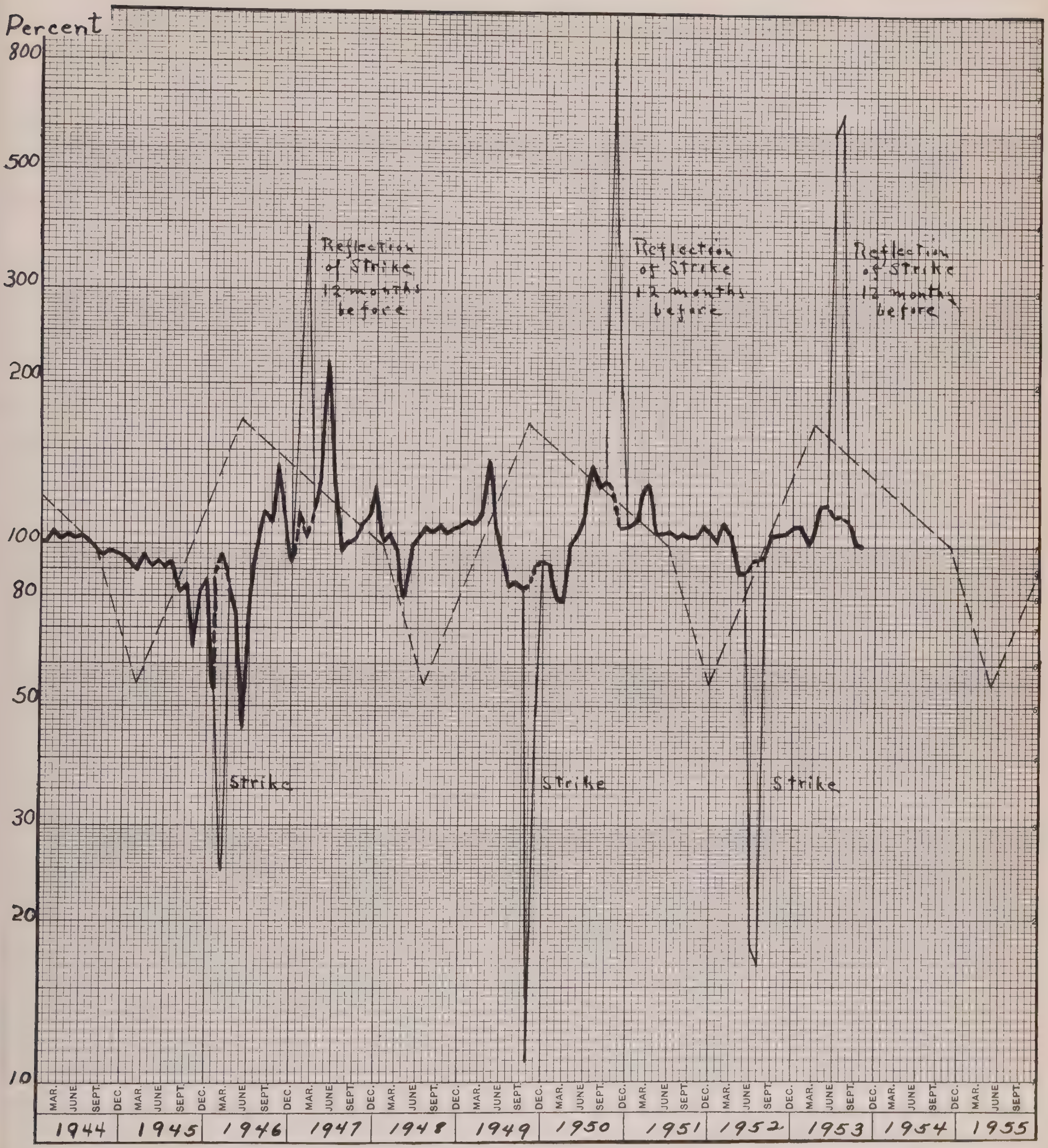


Fig. 6. Rate of Change in Pig Iron Production. This chart is a continuation of Fig. 4 in Chapter VIII. It is on ratio scale. Due to the nature of rate of change, the strikes create artifacts one year later. Here again it is difficult to see the 3½-year cycle by inspection.

had recourse to an additional manipulation of the Dow Jones Industrial Averages as plotted above in Curve 3 on page 109. This manipulation consists of a two 41-month section moving average.

Moving averages and section moving averages are explained in Appendix II and III, reprinted herewith on pages 117 and 118.

A two 41-month section moving average merely averages each two consecutive 41-month cycles. Such a manipulation has no effect whatever upon any regular 41-month cycle that might be present, but does minimize other cycles and random fluctuations so that the 41-month cycle, if present, can be seen more clearly. It is obvious by inspection of Fig. 3 that the 41-month cycle in the Dow Jones Industrial Averages has almost if not entirely, disappeared and that until it reappears, probably with different timing, it should be ignored in attempting to forecast industrial stock prices.

When we come to consider the behavior of pig iron production, at first glance a 41-month cycle is almost as invisible in the actual figures and in the rate of change figures as it was in common stock prices (see Figs. 5 and 6).

On the other hand, when we filter the pig iron production figures by means of a two cycle 41-month section moving average, as explained above for common stock prices, we obtain a curve charted in Fig. 7 below. This curve suggests that the 41-month cycle in pig iron production is, in fact, continuing, but with decreased amplitude and with later than expected timing. The later timing in turn suggests that the length of the cycles in pig iron production is longer than 41-months as originally believed.

I conjecture that the 41-month cycle in pig iron production, so noticeable in the first third of the present century, resulted from the coming together of three or four cycles of this general order of magnitude, but that now at least two of these cycles are offsetting each other, leaving one of the longer components to carry the burden alone.

In a longer series of figures, where the determination was

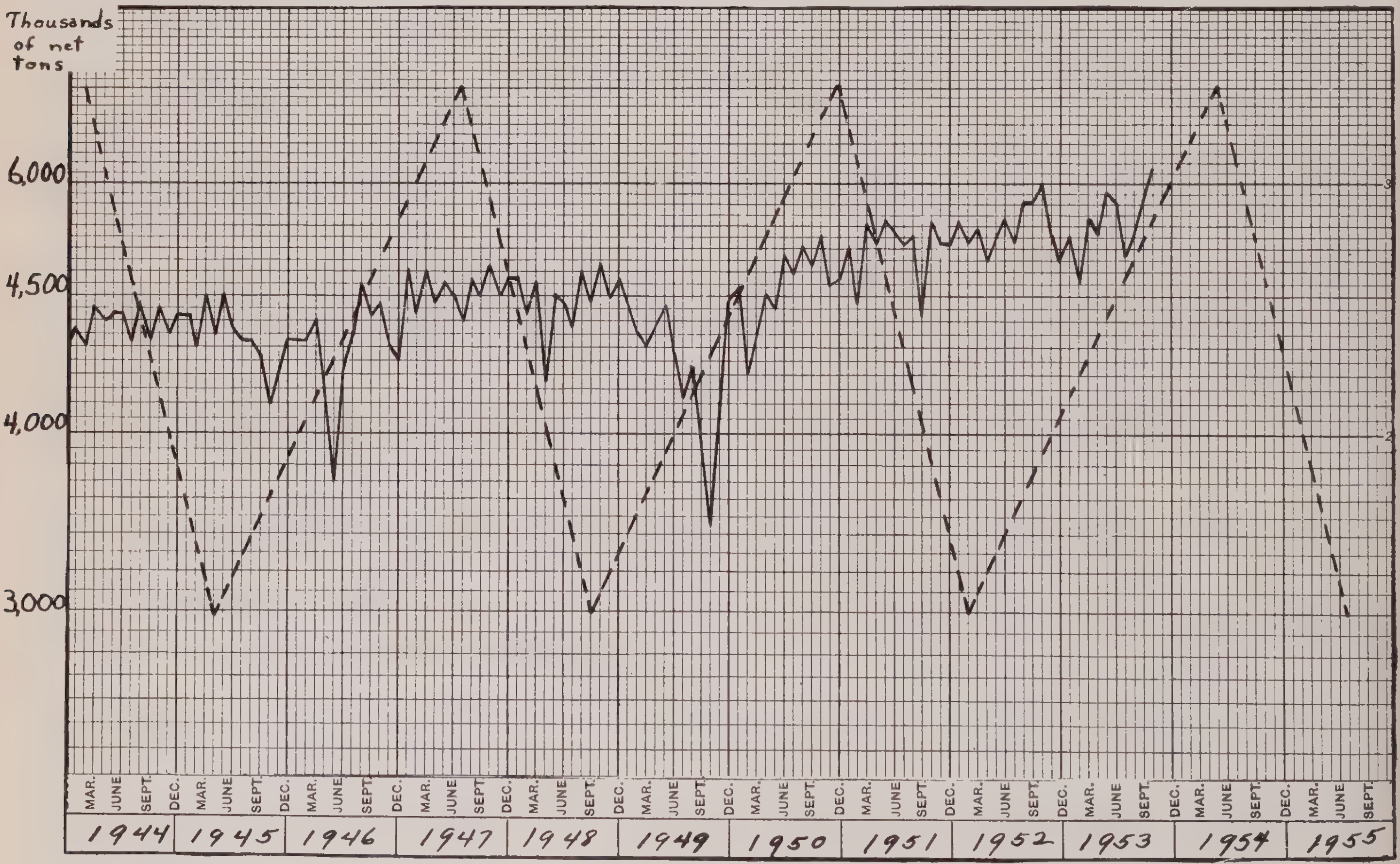


Fig. 7. Pig Iron Production Filtered to Show Any 3½-Year Cycle Present. This chart shows a two cycle 41-month section moving average of the values shown in Fig. 5 above. See text for explanation. It is on ratio scale. This chart suggests that the 3¼-year cycle in pig iron production is continuing with reduced amplitude and that it is now longer than 41 months.

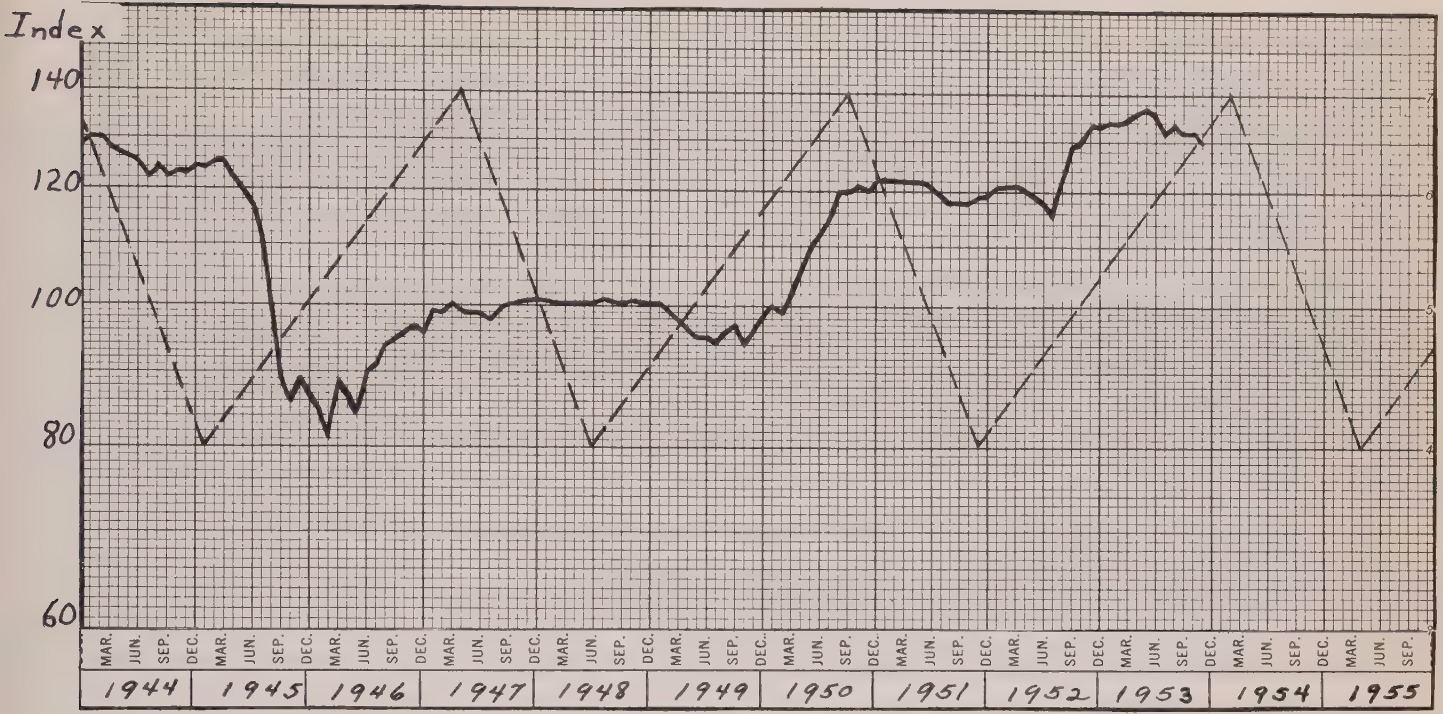


Fig. 8. Industrial Production, 1944—1953. This chart is a continuation of Fig. 1 in Chapter VIII. It is on ratio scale. The 3½-year cycle is clearly evident, but is seen to come consistently later than the time called for by the projection of a 41-month cycle. (New Index 1947—1949 = 100.)

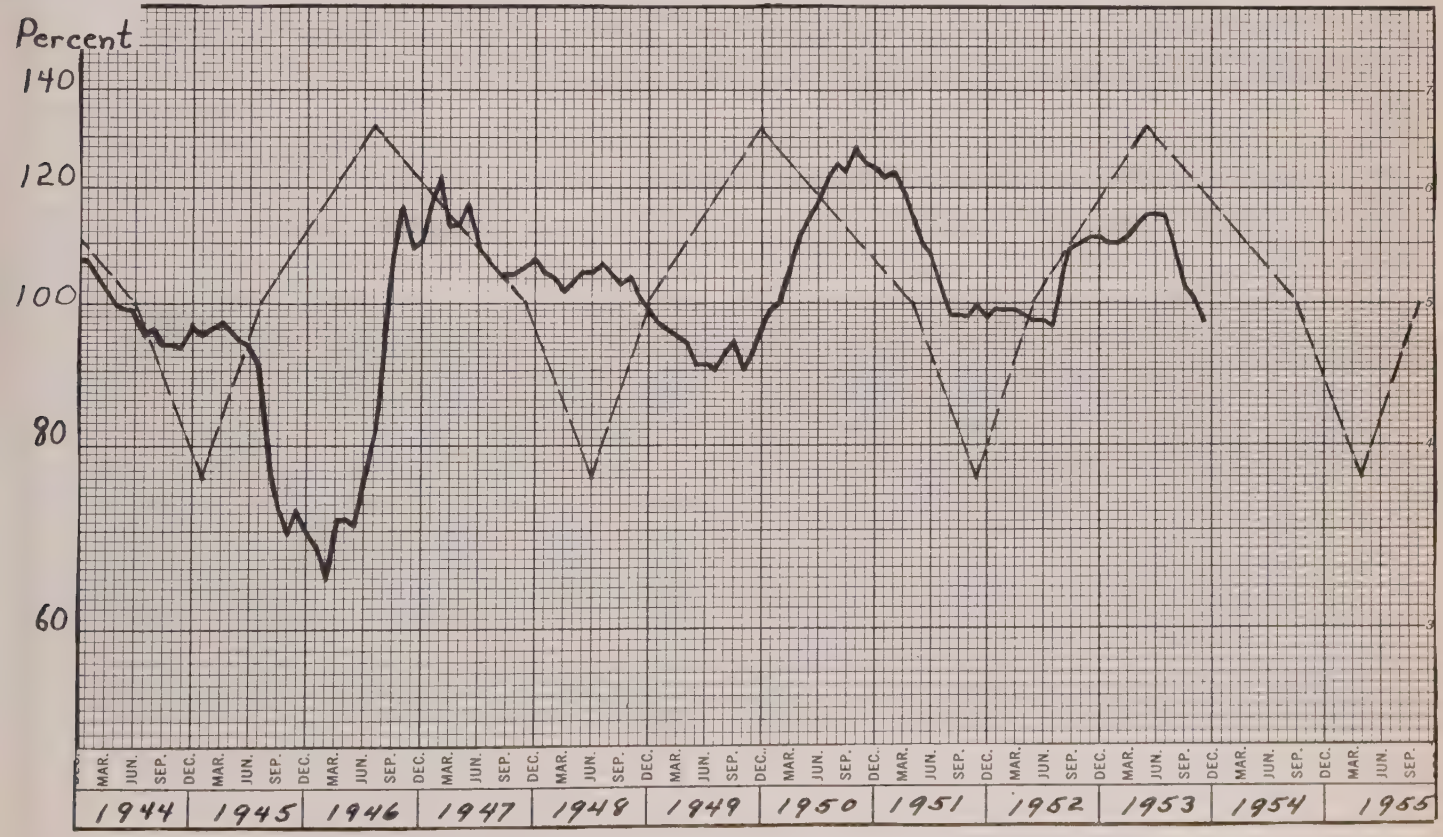


Fig. 9. Rate of Change in Industrial Production. This chart is a continuation of Fig. 2 in Chapter VIII. It is on ratio scale. As in Fig. 8 above, a 3½-year cycle is clearly evident, but with consistently delayed timing.

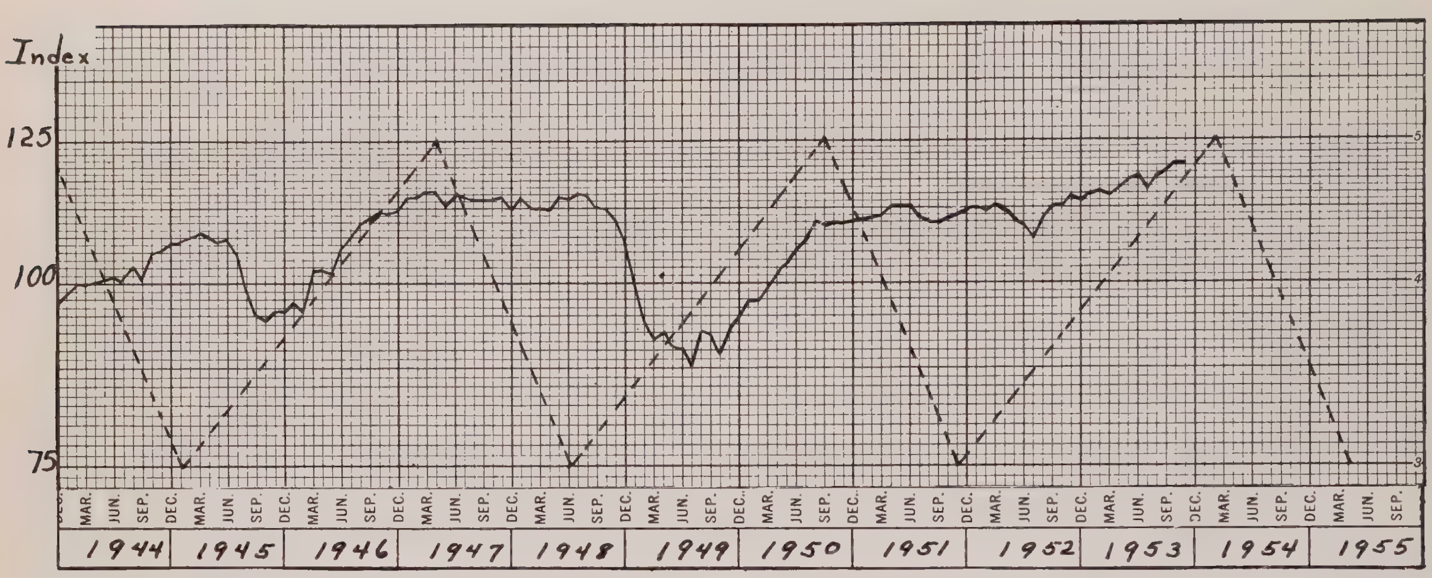


Fig. 10. Industrial Production Filtered to Show Any 3½-Year Cycle Present. This chart is a two cycle 41-month section moving average of the values shown in Fig. 8 above. See text for explanation. It is on ratio scale. From this chart, it is clear that the 3½-year cycle in industrial production is continuing, but that its length at the present time is longer than was manifest in the earlier figures.

made with some accuracy, this longer component proved to be 41.8 months long.

Pig iron production figures are available for more than 100 years, and pig iron price figures are available for 170 years. It is hoped that study of these longer series will solve the mystery and enable us to predict just when the 41-month cycle will reassert itself with its old time vigor and what its wave length and timing will be at that time.

What has been said regarding pig iron production is more or less applicable to industrial production in general, as measured by the Federal Reserve Board Index. The values of this index are plotted in Fig. 8. The rate of change is plotted in Fig. 9. Even from these charts it is evident that the 41-month cycle is continuing, albeit at a somewhat reduced amplitude and much delayed. The delay of a single top or bottom suggests merely a distortion, but the delay of several consecutive tops and bottoms suggests that the cycle is now longer than it was originally.

The exact characteristics of the 3½-year cycle as it has unfolded up to the moment is shown most clearly by the two 41-month section moving average, plotted in Fig. 10. It is clear that the lows now fall about a year later than would be called for by a 41-month pattern, and that the highs fall ideally perhaps six to nine months after the previously determined timing.

I conjecture that the same explanation applies here as with pig iron, namely, that the manifest cycle of 41 months, present in the first third of the century, was the result of several closely related cycles which, by now, have started to pull apart.

I expect the work now being done on this cycle on several long series of figures will ultimately prove or disprove this conjecture.

Summary: I continue to believe completely in the significance of the 3½-year cycle. That is to say, I believe that where it has been present it was not the result of random forces, but rather of cyclic forces of precise regularity. I believe, however, that several different cyclic forces of slightly different wave lengths combined to cause the dramatic behavior first observed in 1909, which came true for the 30 years next ensuing.

In the stock market as a whole, this cycle seems to have vanished completely, but in industrial production as a whole, in the production of many individual commodities, and perhaps in individual stocks, the 3½-year cycle is continuing as an important element. However, in each instance where one wishes to use a knowledge of it to help predict the future, one should determine its wave length over the longest possible period and use the greatest possible accuracy. In most series with which I am most acquainted, where this cycle is continuing, its length now seems to be about 42 months.

E. R. D.

APPENDIX II

Moving Averages

I

THE SIMPLE arithmetic moving average is a flexible mathematical method of smoothing data. The data so smoothed are often used as a trend.

Moving averages may be of any number of terms desired. The process of computing a simple arithmetic moving average is illustrated in the following table:

COMPUTATION OF A 3-YEAR MOVING AVERAGE OF AN INDEX OF WHOLESALE PRICES, 1931–1939

(*A*) *Year*	(*B*) *Index*	(*C*) *3-year moving total of index, centered.*	(*D*) *3-year moving average of index, centered. (The data in Col. C ÷ 3)*
1931	73		
1932	65	204	68
1933	66	206	69
1934	75	221	74
1935	80	236	79
1936	81	247	82
1937	86	246	82
1938	79	242	81
1939	77		

The first average in Column D is $\frac{73 + 65 + 66}{3} = 68$. The second average is $\frac{65 + 66 + 75}{3} = 69$. And so on.

The moving average figure is posted and plotted against the middle of the group of items being averaged " for the same reason that figures referring to a whole period are customarily plotted on a chart in the middle of the appropriate spaces," as Croxton and Cowden explain.

A 5-year moving average would be computed the same way, using five terms instead of three. Thus: $\frac{73 + 65 + 66 + 75 + 80}{5} = 72$. And $\frac{65 + 66 + 75 + 80 + 81}{5} = 73$.

In using an even number of terms it is impossible to get an exact centering. It is therefore usual to compute, in addition, a 2-year moving average of the result. This procedure is shown in the table in the following column.

This method of computation permits of exact centering.

In practice it is usual to take 2-year moving totals of the 4-year moving totals, center them, and divide by eight.

The following chart tells what happens to a regular cycle when the curve of which it is a component is smoothed by moving averages:

It is evident that a moving average has no effect on the *period* or length of the rhythm in the series being averaged. But it does have an effect upon the *amplitude* of the waves.

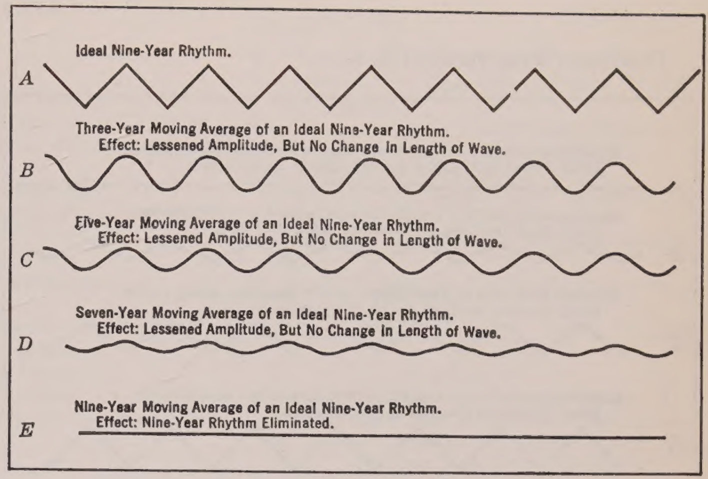


FIG. 1. EFFECT OF MOVING AVERAGE, OF DIFFERENT LENGTHS UPON AN IDEAL 9-YEAR RHYTHM

One may generalize by saying that any moving average with a length less than the period of a rhythm diminishes the amplitude of the rhythm. The more nearly the length of the moving average approached the period of the rhythm, the more nearly it removes it. When the length of the moving average equals the period of the rhythm it completely removes it.

On the other hand, when one computes the deviations of a curve evidencing a rhythm from a moving average of that curve, the length of the rhythm is unaffected, regardless of the length of the moving average.

COMPUTATION OF A 4-YEAR MOVING AVERAGE OF AN INDEX OF WHOLESALE PRICES IN THE U. S. A. 1931–1939:

(*A*) *Year*	(*B*) *Index*	(*C*) *4-year moving total of index, centered*	(*D*) *4-year moving average centered. (The data in Col. C ÷ 4)*	(*E*) *2-year moving total of the 4-year moving average.*	(*F*) *2-year moving average of the 4-year moving average. (The data in Col. E ÷ 2)*
1931	73				
1932	65				
		279	70		
1933	66			142	71
		286	72		
1934	75			148	74
		302	76		
1935	80			156	78
		322	80		
1936	81			162	81
		326	82		
1937	86			163	81
		323	81		
1938	79				
1939	77				

This fact is illustrated in Fig. 2.

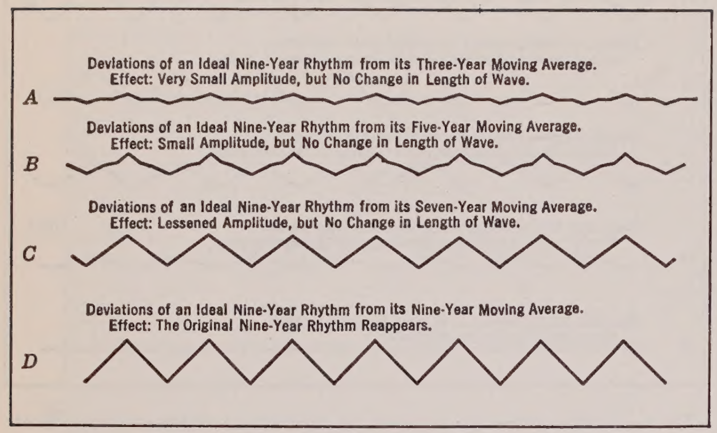


FIG. 2. DEVIATIONS OF AN IDEAL 9-YEAR RHYTHM FROM MOVING AVERAGES OF DIFFERENT LENGTHS

However, as can easily be seen, the amplitude is very much affected by the length of the moving average used.

APPENDIX III

The Section Moving Average

THE SECTION moving average, like the simple moving average described in Appendix II, is a mathematical device for removing irregularities in time series.

Unlike the moving average, however, it does not average consecutive terms or figures of a series. What it does do is to average two or more consecutive sections or cycles.

For example, imagine a series of figures representing the monthly sales for ten years of some business with a seasonal pattern (such as the ice-cream business). In the case selected, the cycle, being seasonal, is twelve months in length. The behavior for each year is influenced by its seasonal pattern, plus accidental distortions, cycles of other than 12 months in length, and trend.

Suppose we wish to calculate a three 12-month section moving average of these figures. We take the first, second, and third Januarys and average them; the first, second, and third Februarys and average them; and so on, month by month, until we have averaged all the months of the first three years. This average of the first three 12-month sections is the first section of the three 12-month section moving average. It is plotted in the second year.

Next we average the second, third, and fourth Januarys, the second, third, and fourth Februarys, and so on, until we have averaged the values for all months in the second, third, and fourth years. This gives us our second section of the three 12-month section moving average. We plot these values in the middle of the span being averaged, namely, the third year.

We proceed in this way until each possible consecutive group of three years has been averaged.

The effect of such a series of calculations is to minimize any of the month-to-month irregularities in much the same way that a 3-month moving average would minimize them. That is, from the standpoint of accidental variations from the true cycle, it is unimportant whether or not we smooth the curve by averaging three consecutive numbers or by averaging three numbers twelve figures apart. In either case, minus distortions will tend to offset plus distortions, and accidental variations of one sort or another will tend to be spread over three months rather than be concentrated in the month in which they occur.

This technique is frequently used to reveal and determine a seasonal variation that changes over a course of time. Suppose, for example, that the seasonal variations have decreased percentage-wise with the increased size of the business. Then any average seasonal variation determined for the entire life of the business will fail to express the variation that took place in the earlier years, and will exceed the variation now present in the business figures. A section moving average will enable one to compute it on a varying instead of a fixed basis.

This technique serves also as a powerful tool in connection with cycle analysis.

First it is useful as a smoothing technique.

Second, it is useful because — even if the length chosen for the section moving average is different from the length of the cycle — this fact has no influence upon the length of the cycle disclosed in the resultant. Thus, in the example chosen above, if we had chopped all series of figures into sections thirteen months long, averaging the first January with the second February and the third March, and so on, the cycle disclosed by this three 13-month section moving average would still show a 12-month period. Likewise, if we had chopped the curves into 11-month sections, the resultant pattern would not have been eleven months in length, but would have been twelve months as it was in the original series. There would, however, in these instances have been a certain dampening of the amplitude of the cycle.

We may generalize by saying that the length of the section moving average has no effect upon the *length* of any real cycle present in the original data, but that, as the length of the section moving average departs from the true length of the cycle, the *amplitude* of the cycle in the resultant average becomes less, until eventually it disappears entirely.

The third useful characteristic of the section moving average is the fact that when a series is simultaneously influenced by two rhythmic forces, and is long enough, a section moving average will completely eliminate either rhythm, no matter how close the length of rhythms involved, leaving the other rhythm undisturbed.

For example, suppose a series simultaneously influenced by two regular cyclic forces, one of eleven months in length and the other of twelve months. By taking an 11-month section moving average of enough terms, the 12-month wave will vanish, leaving the 11-month wave undisturbed. Similarly, a 12-month section moving average of enough terms will eliminate the 11-month wave.

CONTENTS OF MONTHLY REPORTS

September 1952 Vol. III, No 7

The Director's Letter
The Three-Year Cycle in Industrial Common Stock Prices
Order Out of Chaos?
The Seasonal Cycle and Its Relation to Human Characteristics and Abilities, Part I
The 33-Month Cycle in the Sales of Company G
The 9-Year Cycle in New Members in the Presbyterian Church in the U. S. A. (Northern)

Letters
Questions and Answers
Additions to the Library

Supplement
Periodic Inspiration in Poetry and Music
by J. H. Douglas Webster

October 1952 Vol. III, No 8

The Director's Letter
The Bull Market: A 46-Month Cycle Indicator Sees Its End This Year, by Veryl L. Dunbar
The 13-Year Cycle in Automobile Sales
An Old Study of Pig Iron Price Cycles
The Ratio or Semi-Logarithmic Scale
The 6-Year Cycle in the Sales of Armour and Company
The 6-Year Cycle in the Sales of the Pittsburgh Plate Glass Company
The 9.6-Year Cycle in Lynx Abundance

Foundation Affairs
Letters
Additions to the Library

November 1952 Vol. III, No 9

The Director's Letter
More About the 46-Month Cycle in Stock Prices
The 9.6-Year Cycle in Arizona Tree Rings
The 9.6-Year Cycle in the Acreage of Wheat
The 8-Year Cycle in Cigarette Production

Foundation Affairs
Additions to the Library

Supplement
The Journal of Cycle Research, Vol. 1 No. 5 Fall '52
The 9 2/3-Year Rhythm in Rainfall
The 14 2/3-Year Cycle in the Number of Strikes in the United States
Standard Month Numbers

December 1952 Vol. III, No 10

The Director's Letter
The 6-Year Cycle
in Allis-Chalmers
in Pittsburgh Plate Glass
in Youngstown Sheet & Tube
in Jones & Laughlin
in Sears, Roebuck
in Swift & Company
The 33-Month Cycle in Residential Building Construction

Errata
Letters

Supplement
Index, Vol. III, January—December 1952

January 1953 Vol. IV, No 1

The Director's Letter
Periodic Geysers
The 6-Year Cycle in Cotton Production
Standard & Poor's Corporation Industrial Stock Price Index, January 1871—November 1952
Charts of Stock Prices, 1854—1952
U. S. Wholesale Commodity Price Index, Major War Periods
The 6-Year Cycle
in American Viscose Corporation
in Armour and Company
in E. I. du Pont de Nemours and Company
in Monsanto Chemical Company
in Montgomery Ward and Company
in National Lead and Company
Cycles in the Prices of Malleable Iron Pipe Pipe Fittings

Foundation Affairs
Glossary

February 1953 Vol. IV, No 2

The Director's Letter
Trends and Cycles in the Production of Rayon—A Forecast of Viscose Filament Yarn Production (a complete cycle analysis worked out with all the arithmetic)
Letters
Additions to the Library

March 1953 Vol. IV, No 3

The Director's Letter
Predix Techniques, by Vedder Hughey

Supplement
A Cyclical Analysis: Industrial Common Stock Index, 1854—1951, Plate I
by Predix

April 1953 Vol. IV, No 4

The Director's Letter
Cycles in Solar Heat
Cycles in Wildlife
Variable Stars
The Law of Cycle Length
The 6-Year Cycle in Armco Steel
Chart of Wheat Prices in England
Chart of Wrought Iron Prices

Foundation Affairs
Letters
Additions to the Library
Glossary

Supplement
A Cyclical Analysis: Industrial Common Stock Index, 1854—1951, Plate 1-A
by Predix

May 1953 Vol. IV, No 5

The Director's Letter
The 9.3-Year Cycle in Wheat Prices
The 8-Year Cycle in Barometric Pressure at New York City
C. N. Anderson's Sunspot Cycles
Presbyterian Church Membership

Questions and Answers
Letters
Foundation Affairs

Supplement
A Cyclical Analysis: Industrial Common Stock Index, 1854—1951, Plate II
by Predix

June—July 1953 Vol. IV, No 6

The Director's Letter
Continental Oil Company—Cycles, Trend, and Forecast
The 9.3-Year Cycle in Grasshopper Outbreaks
A 45 6/7-Day Cycle in a Common Stock
What's Ahead for Wheat Prices? Part I
The 6-Year Cycle in Continental Oil Company Income
The 6-Year Cycle in Wilson & Company Sales
The Predix Industrial Common Stock Analysis

Foundation Affairs
Letters

Supplement
Introduction, Chapter I and Chapter II, from Cycles, The Science of Prediction, a book by Edward R. Dewey and E. F. Dakin, together with 1953 Postscript.

September 1953 Vol. IV, No 7

The Director's Letter
Bethlehem Steel Corporation--6-Year Cycle
The Cycles of the Planets
What's Ahead for Wheat Prices? Part II
The 6.41-Month Cycle in Stock Prices
The Predix Industrial Common Stock Analysis (Reprinted)

Foundation Affairs
Letters
Additions to the Library
Glossary

Supplement
Chapter III, Chapter IV, and Appendix I, from Cycles, The Science of Prediction, a book by Edward R. Dewey and E. F. Dakin, together with 1953 Postscript.

October 1953 Vol. IV, No 8

The Director's Letter
Liabilities of Commercial and Industrial Failures in the United States, 1857—1953
The 17.75-Year Cycle in Failures
The 9.2-Year Cycle in Failures
The 3.4-Year Cycle in Failures
The 5.9-Year Cycle in Failures
The 6.5-Year Cycle in Failures
Trend and Forecast of Failures
Cycles in the Stock Market

Foundation Affairs
Questions and Answers
Additions to the Library
Glossary
Letters

Supplement
Chapter V from Cycles, The Science of Prediction, a book by Edward R. Dewey and E. F. Dakin.

741 Rush

Mr. H. A. Musham
741 No. Rush St.
Chicago, Ill.

Feb.
#3011

WANTED
BACK COPIES OF "CYCLES"

We will pay $1 each for the first ten copies received of each of the following reports:

June 1950 September 1950
October 1953

Please indicate what you wish done with the report if it is not one of the first ten we receive. Shall we send it back to you?

FOR SALE
BOUND SETS OF "CYCLES"

While the supply lasts, 1950, 1951, 1952, 1953 at $9.90 per volume.

FOR SALE
SETS OF "CYCLES"

Sets of back copies at the following prices:

1950 October, November, and December. . . . . (All five issues, if we get them, $5.00)	$2.00
1951 All ten issues.	5.50
1952 All ten issues.	5.50
1953 All ten issues. . . . . . . (We will refund 50¢ if we are unable to supply the October issue.)	5.50

FOR SALE
SINGLE COPIES OF "CYCLES"

Individual back copies of reports $1.00 each. (For partial list see inside of back cover.)